DOCUMENT RESUME

ED 089 529 EC 061 497

AUTHOR	Bricker, Diane; Bricker, William
TITLE	Infant, Toddler, and Preschool Research and Intervention Project Report--Year III.
INSTITUTION	George Peabody Coll. for Teachers, Nashville, Tenn. Inst. on Mental Retardation and Intellectual Development.
PUB DATE	73
NOTE	132p.; IMRID Behavioral Science Monograph No. 23. For related information see EC 052 462
EDRS PRICE	MF-$0.75 HC-$6.60 PLUS POSTAGE
DESCRIPTORS	Demonstration Projects; Early Childhood Education; *Exceptional Child Education; *Exceptional Child Research; Infancy; Inservice Teacher Education; *Intervention; Mentally Handicapped; Parent Role; *Program Descriptions; Research Reviews (Publications); Theories
IDENTIFIERS	*Developmental Disabilities; Tennessee

ABSTRACT

Presented in the third year report of the Infant, Toddler, and Preschool Research and Intervention Project *Nashville, Tennessee) are discussions on theoretical applications, educational services provided for 75 6-month to 6-year-old children and their families, and teacher training procedures; and 12 research summaries. Discussed is the project's theoretical basis which emphasizes analysis of the child's interactions with his environment and adherence to the sensorimotor theory of J. Piaget for language training. Five projects goals are given such as demonstration that a service and research project can be blended, that intervention is desirable and feasible, and that parents should be included. Described are the following program aspects: the physical setting (Classroom for infants, toddlers, and preschoolers); the school population, comprised of low and middle income developmentally delayed and normal children; classroom schedules; the parent advising component, which involved behavioral modification training and aids such as home visits; and teacher training. Included are the following research summaries: five studies on aspects of Piaget's sensorimotor theory such as object permanence, causality relations, and construction of space; two studies on teachers' and mothers' teaching styles; and five language studies that focus on receptive and expressive vocabulary, syntax assessment, verbal imitation assessment, and children's functioning in five domains. (MC)

ED 089529

IMRID
INSTITUTE ON MENTAL RETARDATION AND INTELLECTUAL DEVELOPMENT
A UNIT OF THE
John F. Kennedy Center for Research on Education and Human Development
GEORGE PEABODY COLLEGE FOR TEACHERS/NASHVILLE, TENNESSEE 37203

IMRID Behavioral Science Monograph No. 23

INFANT, TODDLER, AND PRESCHOOL RESEARCH AND INTERVENTION PROJECT

REPORT-YEAR III

by

Diane Bricker

William Bricker

U.S. DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION
THIS DOCUMENT HAS BEEN REPRO
DUCED EXACTLY AS RECEIVED FROM
THE PERSON OR ORGANIZATION ORIGIN
ATING IT. POINTS OF VIEW OR OPINIONS
STATED DO NOT NECESSARILY REPRE
SENT OFFICIAL NATIONAL INSTITUTE OF
EDUCATION POSITION OR POLICY

Institute on Mental Retardation and Intellectual Development

George Peabody College for Teachers

Nashville, Tennessee

1973

INFANT, TODDLER AND PRESCHOOL RESEARCH AND INTERVENTION PROJECT

REPORT - YEAR III

Diane Bricker

William Bricker

In Collaboration With:

Gisela Chatelanat
Laura Dennison
John Filler
Richard Iacino
Roger Smith
Lisbeth Vincent-Smith
Linda Watson

And Assistance From:

Sue Biddle
Barbara Bogart
Richard Brinker
Deborah Dean
Reida Gambill
Jan Oden
Margaret Robertson
Cordelia Robinson
Sue Rothacker
Randy Silver
Sharon Spritzer
Zolinda Stoneman
Linda Tucker
Nancy Wallace

ACKNOWLEDGEMENTS

We have had the opportunity during the past three years to visit many projects, agencies, universities and talk with other professionals and nonprofessionals engaged in work similar to our own. We have come to realize that at Peabody we have had a unique set of circumstances which fostered the growth and development of the Infant, Toddler, and Preschool Research and Intervention Project. The superb physical setting, children and parents in need of our service, freedom to structure the program as data, scholarship and our best intuitions dictated, the good fortune to have functional students, a dedicated staff and finally the "strange mixture" of all of these elements into a single operative system have combined to breed optimism about the futures of our children. Our task has been to provide the facilitating mechanism for this mixture to function. The future challenge lies in developing training programs for teachers, parents and children. We have made a beginning and for the cooperation of the many individuals who have helped we are extremely grateful.

The research reported herein was supported in part by the Joseph P. Kennedy Jr. Foundation, the Kennedy Center Experimental School, and the Mental Retardation Research Training Program (NICHHD, Grant No. HD00043). The primary support for the Toddler Project, which constitutes the core of the Laboratory on Infant and Toddler Development, comes from the Institute on Mental Retardation and Intellectual Development (NICHHD, Grant No. HD00973), and Parent Teaching Style: Assessment and Modification (NICHHD, Grant No. HD07073).

Table of Contents

Page

Foreword v

Introduction 1

Major Objectives of the Project 12

Operational Structure of the Project 13

Physical Setting and Children 17

Description of the Major Components 22

Parent Advising Component 29

Demonstration and Student Training Component 37

Research Component 40

References 114

LIST OF TABLES

TABLE PAGE

1 Demographic Information on Infant, Toddler and Preschool Children 20

2 Recording Form Used to Categorize Child's Responses to Toys Across Repeated Presentation . 51

3 List of Toys Classified by Manipulandum and Immediacy of Response 52

4 Lexical Items Used to Elicit Initial Consonant Sound 103

5 Intercorrelation Matrix Using CV, CVCV, and Word Measures for the Delayed and Nondelayed Groups .105

6 Rank Order Sequence Based on the Mean Rate Correct in Three Productions 106

7 Sounds Used in the 13 Test Stimuli 108

LIST OF FIGURES

FIGURE		PAGE
1	A Representation of Sensorimotor Development.	10
2	Organizational Structure of the Project . . .	14
3	Schematic of the Physical Setting of the Classrooms, Research Laboratories, and Ancillary Service Areas	18
4	Mean Sensorimotor Assessment Performance for Delayed and Nondelayed Children Across Chronological Age Levels	48
5	Effects of Experimental Conditions on Vocalization	61
6	Number of Flips Per Minute Under Conditions of Free and Taped	63
7	Number of Teeth Grinds Per Minute Under Conditions of Taped and Free	64
8	Mean Total Appropriate Responses on the Object Permanence, Means-End and Spatial Relations Scales Across Assessments	69
9	Mean Number Correct Across Session, for Known and Unknown Problems	85
10	Mean Number Correct on Unknown and Known Problems, for High and Low MA Subjects . .	86
11	Mean Number Correct Collapsed Across Test Administrations for the Delayed and Nondelayed Children on the Test Areas, Imitation, Comprehension and Production . .	99
12	Mean Number Correct on the Five Language Related Domains for the Three MA Groups . .	111

FOREWORD

This report completes the third year of operation for this project. If this year were to be summed up in a word, that word would be expansion. Expansion is evident in the size of the population which increased from 30 to 75 children. Expansion occurred in the curriculum. Expansion and development of a rationale or theoretical basis for the activities incorporated into the project has also been a major accomplishment during the third year. Finally, even our name has expanded to the Infant, Toddler, and Preschool Research and Intervention Project.

During the first year of operation we established the project as "...a research program structured to devise and evaluate several different aspects of educational intervention with children who are between one and four years of age and who have moderate to severe developmental problems." This goal was maintained as the operating thesis during the second year of the project. The first year was basically devoted to organization and testing whether or not a project of this nature could survive as a research base. By the second year we were clearly into the black on an operational basis and thus more time was spent in collecting laboratory data and attempting to refine our service delivery system. Changes in the operation of the project during the third year necessitated some basic reconceptualizations of the basic goals of the project. First, we included primary service delivery for the child and his family as an important goal. This has not been done at the expense of our research program and probably has served to make our data collection even more educationally relevant. Second, we now serve children who are between six months and six years of age. We were also able to develop a parent training component that has a research base but has been primarily directed toward service.

The expansion of the third year population, made possible by the addition of Title 4-A funds[1], demanded an increase in staff; however, even with additional people the research and service systems have been forced to operate on a lean staffing ratio all year. The importance of cooperation among the varying components has been underscored by the increased demands and pressures. From these cooperative efforts have come a series of written reports detailing the structure and role of each component, specified objectives, development of effective training programs and coordinated research efforts dealing with questions raised by the children's performance on curriculum materials. One of the primary goals of the fourth year will be to validate the materials generated during this exciting third year of operation.

We hope the reader will have the opportunity to browse the reports of years I and II but for those who cannot this report will, when appropriate, attempt to briefly recapitulate the past history that has led the staff to certain positions and statements. Each year has provided us answers but always there were more questions. What we have demonstrated to date is only a small beginning in providing suitable and empirically validated programs for developmentally delayed and normal children. However, even this meager amount of knowledge must be quickly disseminated given the great needs of the children and their parents and the paucity of information on infant, toddler, and preschool education from other sources.

---

[1] This grant was from the Tennessee Department of Public Welfare with matching funds provided by the State Department of Mental Health and the Joseph P. Kennedy Jr. Foundation.

Introduction

Theoretical Orientation of the Project

Over the period of a decade, ever since the publication of J. McV. Hunt's book Intelligence and Experience (1961), researchers and educators who focus their professional competencies on the problems of retarded people have greatly neglected a remarkable opportunity to move the study of mental retardation in a new direction. The position of behavioral development as a function of the principle of interaction, as described by Hunt and others, has received many favorable reviews but has influenced few who have been in a position to alter the ameliorative processes pertaining to retarded persons. Hunt has noted a more general resistance to his proposals in a recent article (1972) and again suggests that the concept of intelligence as an innate process be rejected and replaced by a developmental position based on the theoretical insights of Jean Piaget (1970). The behavioral scientists in mental retardation continue to operate from an outdated and inadequate learning theory position in a quest for the defects and deficiencies in learning that result in retarded development (cf. Ellis, 1966, 1968, 1969, 1970, 1973). Such quests have tested hypotheses about stimulus trace deficit, short-term memory deficits, attention deficits, long-term memory consolidation deficits, rehearsal deficits, and even reinforcement history deficits. Reading through the prodigious literature resulting from this effort, one is amazed at how much effort has been expended on the basis of such a lean reinforcement schedule and is forced by the data products of this research to come perilously close to Weimer's (1973) conclusion that in 2500 years of effort we have learned little about complex human behavior. Certainly, we have not learned much that is of help to the developmentally delayed person residing in an institution or working in a sheltered workshop. Even the "revolutionaries" who are attempting to alter the pattern of treatment of the retarded have, among their leaders, those who are clearly defectologists in the explanations of retarded development (Wolfensberger, 1972).

The errors that we continue to make in both behavioral research and education in the field of retardation stem from a grossly inadequate set of theories pertaining to complex human behavior. The extent of these inadequacies has been forcefully reappraised by Chomsky (1957, 1959, 1965) who simultaneously synthesized a new system of generative grammar and called for a return to mentalism as an explanation of how humans learn to sequence words in grammatically correct structures. Mentalism, with or without reference to cognitive development, was pushed by a number of writers (Miller, Galanter, & Pribram, 1960; Katz, 1967; Breger & McGaugh, 1965) who brought the issue into the center of theoretical debate in psychology. Language development and language training became the forum for debates of the adequacy of various theories. Since delay in language acquisition is the hallmark of mental retardation, the outcome of these debates could well determine the form of instruction provided for the developmentally delayed child and even bring into question the utility of providing instruction in in the first place. The crux of the issue is whether language and other complex forms of behavior are the result of innate and unchangeable structures formed in the genetic code of the human species or are modified as a consequence of interaction with stimulating environments. The plausibility of the genetic thesis can only be tested as a consequence of intervention efforts which seek to organize environmental stimulation in ways that alter development in both rate and direction. Before describing an approach that we feel provides an exciting and optimistic alternative to the education of moderately and severely retarded child, we choose to examine some of the specific weaknesses and errors of the current positions as well as their strengths since these form the basis and justification for any alternative.

An interesting and unexpected position has been enunciated recently (Weimer, 1973) which provides an excellent battlefield for testing the variety of approaches to complex human behavior and retardation. Basing his scholarly discussion on two of Plato's paradoxes as represented in the Meno, Weimer believes that knowledge of abstract entities and the ability for "productive" or "creative" behavior must be innate. In reference to abstract entities, Weimer indicates the impossibility of recognizing a member of a concept class unless one has prior knowledge of the concept itself which leads to a restatement of Plato's paradox, namely: "We cannot learn (come to know) anything unless we already know (have learned) it." Weimer then turns to linguistic theory to supply the basis for the second paradox which involves creative production. In Chomsky's linguistic position, a theory of language must provide a suitable explanation of the novel but appropriate use of language. This involves ". . . the speaker's ability to produce new sentences, sentences that are immediately understood by other speakers although they bear no physical resemblance to sentences which are 'familiar' (Chomsky, 1966, p. 11)." The second paradox derives from this point and asks the question: ". . . how can one exhibit knowledge for which one's prior learning history has given no preparation? (Weimer, 1973, p. 25)." Weimer presents several attempted solutions to these paradoxes, including Aristotle's doctrines of nominalism and associationism. On the basis of his evaluation of both the data and the logic, he contends that these principles of associationism (virtually every learning theory uses them) are inadequate in accounting for complex human behavior.

A simple form of defense is to ignore the nativist argument. A more difficult task is to attempt to question it through appropriate evidence. If this position is allowed to stand or to gain support (through increased bandwagon riders) then programs of stimulation and training especially for children who do not give evidence of suitable innate structures could be logically phased out as futile gestures. In the view of the present writers, the hypothesis of innate structures must be considered rather than ignored and by considering it seriously, prevent the nativism position from impeding progress in the development of effective intervention programs.

One way out of this apparent dilemma is to define the innate endowments of an infant more precisely. The key to doing this adequately is to consider the concept of "interaction" in some detail. As indicated recently by Dobzhansky (1972) the full range of biological and behavioral structures and their functions are determined by an inevitable and unceasing interaction between genetic determiners and the full range of environments encountered by the organism. In concluding his discussion of this matter, Dobzhansky states:

> In flies, as well as in men, the genetic endowment determines the entire range or reactions, realized and unrealized, of the developing organism in all possible environments. A much less happy formulation, often met with in the literature, is that the genotype determines the limits, the upper and the lower extremes, which a character, say a geotactic response, or stature, or IQ, can reach. This would make sense only if we were able to test the reactions of a genotype in all possible environments. Environments are infinitely variable, however, and new ones are constantly invented and added. . . . It would require not a scientifiic but something like a divine knowledge to predict how much the stature, or IQ, or mathematic ability of any individual or population could be raised by environmental or educational modifications or improvements (1972, p. 530).

When this statement is compared to a recent statement by Piaget (1970), the comparison leads to an interesting basis for questioning Weimer's thesis as well as those of other advocates of a purely nativistic position. Piaget says:

> The establishment of cognitive or, more generally, epistemological relations, which consist neither of a simple copy of external objects nor of a mere unfolding of structures performed inside the subject, but rather involve a set of structures progressively constructed by continuous interaction between the subject and the external world (p. 703).

Piaget goes on to state: "We begin [a discussion of his theory] with the last point [quoted above] on which our theory is furthest removed both from the ideas of the majority of psychologists and from 'common sense'." This seems to be confirmed in that no reference is made to Piaget in Weimer's paper. It is also true that references to Piaget in the behavioristic literature are rare. Perhaps, however, his position represents the synthesis that investigators and theorists at either extreme might find suitable.

The search for synthesis has most recently been discussed by Catania (1973), who argues that the psychologies of structure, function, and development appear to conflict because they employ different vocabularies. If it can be shown satisfactorily that the various research areas in psychology complement rather than conflict with each other, Catania maintains that controversy may give way to more productive interaction. Having illustrated how various problems of psychology can be interpreted as problems of structure or of function, he turns to the task of relating these two subdivisions to problems of development, and in doing so arrives independently at the synthesis of theory and methodology we have proposed. Catania (1973) says: "It might have been anticipated that the study of development, too, would divide into functional and structural components (e.g., respectively, Bijou & Baer, 1966; Piaget & Inhelder, 1969)."

If, as Dobzhansky indicates, environments are infinitely variable, we must seek to find intervention strategies that work. Attempts at amelioration should represent a synthesis of the available facets of our knowledge of the normal course of development and the variables that influence it. As an infant interacts with his environment, structural and conceptual organizations of behavior are formed which will alter the subsequent interactions the child (delayed as well as normal) will have with future environments. If we can analyze the ways in which particular interactions with the environment organize a young child's behavior and if we can determine how a particular organization operates as a prerequisite to subsequent forms of behavior, we will then be in a better position to structure the form and time sequence of interactions necessary to produce a more rapid acceleration in the acquisition of new and more complex forms of behavior. This assumption underlies our program.

As an example of the interaction position Sinclair-de-Zwart (1969) has described the mechanisms by which the Piagetian sensorimotor developments occur during the first years after birth and the means by which they become coordinated as the basis of complex cognitive processes as well as the foundation of language. The sequence of sensorimotor schemes develops out of the reflexive system of the neonate as a consequence of the biological system interacting with the environment. As schemes become elaborated in this way, they move in the direction of providing a preverbal knowledge of events and relationships. The child learns to depress the button to release the jack-in-the-box. His mastery of wind-up cars progresses from manual propulsion to interest in and competence with the key. His grasp of the permanence of objects moves from search for a partially obscured familiar object to systematic search for an object which is no longer where he last saw it. He learns to chain and embed schemes when he coordinates means to achieve an end, such as pulling a platform toward him to grasp what is on it, and pulling a chair to a counter in order to get what is on the counter. He relates objects to action, other objects to himself when he uses the mallet to sound the xylophone, places the doll in bed, feeds the doll with the spoon, or drinks milk from his cup and stirs his ice cream with a spoon. These and other facets of knowledge pertaining to space and timing of events in turn become coordinated.

It is this basic interaction between those schemes already in the child's repertoire and new environmental experiences or modification of familiar stimuli that allow the child to develop new responses. Clearly each new response is predicated on the child's existing schemes—a point too often neglected in training programs for the developmentally delayed child.

Cognitive Basis of Language

The field of developmental retardation must be cited as the locus of numerous exercises in extreme futility. There is no better evidence for this statement than that which is found in the scientific research and practical applications in the area of language development and language training of the retarded person. Traditionally, language has been studied primarily in institutional settings with people who are more than six years of age. As a result of this decision, our collective knowledge about the process of language learning among the retarded is not only inaccurate but also detrimental. We now know that one studies language development and language training not with institutionalized children between the ages of six and 15 years but with infants and young children who are between six months and six years of age and who are living confortably in their own homes. Even this is a superficial aspect of the problem. For beyond the ages and living conditions of the retarded child is the use of a knowledge system that allows for a relatively adequate approach to the language process in its own right.

As indicated earlier, the system of behavior that forms a basis for our current language training activities is predicated on Piaget's (1962, 1967, 1970) view of sensorimotor development. In 1969, Sinclair-de-Zwart provided an important link between sensorimotor and other cognitive developments including linguistic processes. The task for our research group has been to operationalize these developments so that adequate assessments can be made of the important processes and then intervention techniques can be formulated in an explicit manner and tested for their adequacy in producing a generative repertoire with those children who would under normal conditions be labeled moderately and severely retarded. These efforts to operationalize a sensorimotor basis for language and other complex forms of human behavior has become a research priority in our attempts to develop intervention strategies for infants and young children.

Developmental theory must begin with the most basic processes that are available for change as a function of interaction with environmental events. Generally, a theorist interested in complex human behavior would start with the reflexes of the newborn as does Jean Piaget. However, this is more of a convenience than a requirement since the reflexes are themselves a product of interactions that have taken place in the uterus during the prenatal period and include interchanges with such environmentally based events as nutrition, disease, drugs, and physical injury. Thus, the quality of the reflexes themselves as well as their adaptability are an outgrowth of earlier interactions between biological and environmental events. Given the reflexes, the improvement or progress in behavior is a consequence of processes of adaptation called assimilation and accommodation by Piaget. Even strict behaviorists need not be bothered by these terms since they refer to publicly available relationships between existing repertoires and impinging environments. Starting with the reflexes, Piaget describes the adaptations of the infant in terms of six levels or stages of development in the sensorimotor period. Figure 1 contains a representation of the theoretical framework for the sensorimotor training activities. The ascending box structure in Figure 1 is used to represent increasing complexity of behavior that correlates with increasing chronological age. Interaction theory does not include a concept of maturation or a requirement of normative patterns of

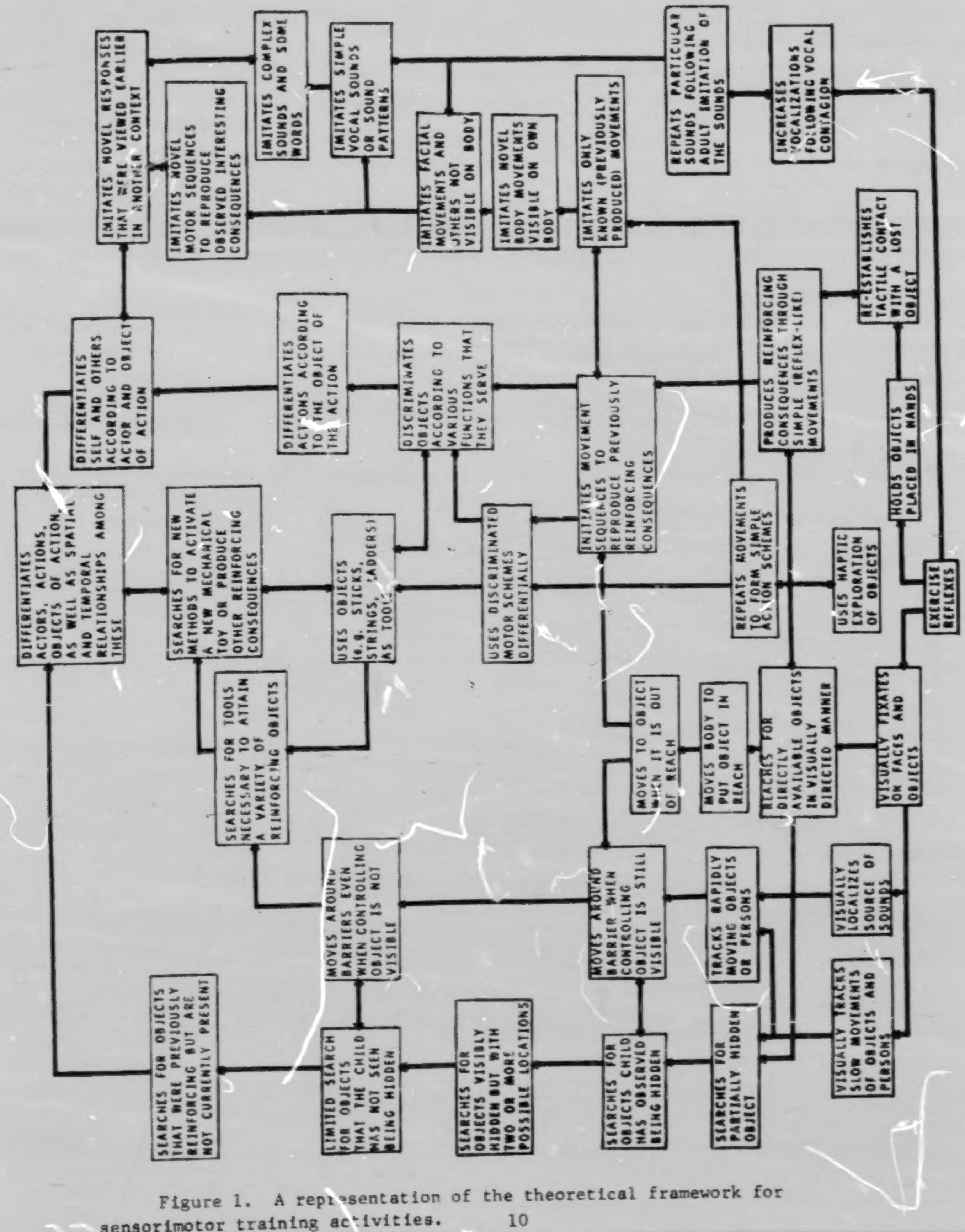
IMITATES NOVEL RESPONSES THAT WERE VIEWED EARLIER IN ANOTHER CONTEXT
IMITATES COMPLEX SOUNDS AND SOME WORDS
IMITATES NOVEL MOTOR SEQUENCES TO REPRODUCE OBSERVED INTERESTING CONSEQUENCES
IMITATES SIMPLE VOCAL SOUNDS OR SOUND PATTERNS
IMITATES FACIAL MOVEMENTS AND OTHERS NOT VISIBLE ON BODY
IMITATES NOVEL BODY MOVEMENTS VISIBLE ON OWN BODY
IMITATES ONLY KNOWN (PREVIOUSLY PRODUCED) MOVEMENTS
REPEATS PARTICULAR SOUNDS FOLLOWING ADULT IMITATION OF THE SOUNDS
INCREASES VOCALIZATIONS FOLLOWING VOCAL CONTAGION
DIFFERENTIATES SELF AND OTHERS ACCORDING TO ACTOR AND OBJECT OF ACTION
DIFFERENTIATES ACTIONS ACCORDING TO THE OBJECT OF THE ACTION
DISCRIMINATES OBJECTS ACCORDING TO VARIOUS FUNCTIONS THAT THEY SERVE
INITIATES MOVEMENT SEQUENCES TO REPRODUCE PREVIOUSLY REINFORCING CONSEQUENCES
PRODUCES REINFORCING CONSEQUENCES THROUGH SIMPLE (REFLEX-LIKE) MOVEMENTS
RE-ESTABLISHES TACTILE CONTACT WITH A LOST OBJECT
DIFFERENTIATES ACTORS, ACTIONS, OBJECTS OF ACTION, AS WELL AS SPATIAL AND TEMPORAL RELATIONSHIPS AMONG THESE
SEARCHES FOR NEW METHODS TO ACTIVATE A NEW MECHANICAL TOY OR PRODUCE OTHER REINFORCING CONSEQUENCES
USES OBJECTS (e.g. STICKS, STRINGS, LADDERS) AS TOOLS
USES DISCRIMINATED MOTOR SCHEMES DIFFERENTIALLY
REPEATS MOVEMENTS TO FORM SIMPLE ACTION SCHEMES
USES HAPTIC EXPLORATION OF OBJECTS
HOLDS OBJECTS PLACED IN HANDS
EXERCISE REFLEXES
SEARCHES FOR TOOLS NECESSARY TO ATTAIN A VARIETY OF REINFORCING OBJECTS
MOVES TO OBJECT WHEN IT IS OUT OF REACH
MOVES BODY TO PUT OBJECT IN REACH
REACHES FOR DIRECTLY AVAILABLE OBJECTS IN VISUALLY DIRECTED MANNER
VISUALLY FIXATES ON FACES AND OBJECTS
MOVES AROUND BARRIERS EVEN WHEN CONTROLLING OBJECT IS NOT VISIBLE
MOVES AROUND BARRIER WHEN CONTROLLING OBJECT IS STILL VISIBLE
TRACKS RAPIDLY MOVING OBJECTS OR PERSONS
VISUALLY LOCALIZES SOURCE OF SOUNDS
SEARCHES FOR OBJECTS THAT WERE PREVIOUSLY REINFORCING BUT ARE NOT CURRENTLY PRESENT
LIMITED SEARCH FOR OBJECTS THAT THE CHILD HAS NOT SEEN BEING HIDDEN
SEARCHES FOR OBJECTS VISIBLY HIDDEN BUT WITH TWO OR MORE POSSIBLE LOCATIONS
SEARCHES FOR OBJECTS CHILD HAS OBSERVED BEING HIDDEN
SEARCHES FOR PARTIALLY HIDDEN OBJECT
VISUALLY TRACKS SLOW MOVEMENTS OF OBJECTS AND PERSONS

Figure 1. A representation of the theoretical framework for sensorimotor training activities.

development. Consistencies among the sequence of developments of children are viewed as the result of approximately equivalent interactive experiences occurring at about the same time as well as logical and empirical requirements of a fixed order of structures of schemes in the developmental process. Thus, starting at the bottom of Figure 1 with the exercising of the reflexes, the order of these structures is given in the ascending model. The right-left dimension of the figure is arbitrary but the vertical dimension refers to developmental sequence with schemes of the same distance from the baseline coming into existence at about the same time. The highest point in the figure can be viewed as the terminal state in sensorimotor developments and includes the preverbal cognitive prerequisites to the semantic, phonological, and syntactic language processes. However, these developments also relate to the understanding of space, time, physical causality, seriation, number, and classification of environmental events including social relationships.

In summary, a review of the reports from previous years will reflect the changing orientation of the project. Initially our concern focused on the specification of critical behavioral domains and the development of efficient strategies for establishing criterion behavior within these domains. Partially as a function of our efforts in this direction and an increasing awareness of the contribution of developmental theorists such as Jean Piaget we have turned our attention to the investigation of interrelationships among specific skill areas and prerequisites to each of these areas.

Major Objectives Of The Project

In comparison with our theoretical and conceptual concerns, the factual and practical goals of a project such as ours may seem mundane. However, the attainment of these goals, which were outlined in the second year report as well as below can only be reached as a function of improved conceptions about development and empirical tests of their efficacy. The goals are:

(1) To demonstrate that service and research components can be successfully blended into a single project.

(2) To demonstrate that early intervention with young developmentally delayed children is not only desirable, but feasible.

(3) To demonstrate that the integration of developmentally delayed and normal developing children can result in an effective program for both types of children.

(4) To demonstrate that assessment can be more useful for structuring intervention programs when linked directly to training procedures.

(5) To demonstrate that parents or caretakers can and should be included as an integral part of an intervention program.

Many years may pass before we can speak with assurance about whether any of these goals have been reached. Nevertheless, we feel that a report of even tentative findings will help others in determining what intervention strategies will best meet the needs of developmentally delayed children. The remainder of this report contains information on our progress toward meeting these goals.

Operational Structure of the Project

As mentioned in the foreword, the project has doubled in size during the third year of operation. This increase in size has demanded changes in the organizational structure of the project. During the first two years of operation the number of staff members was small enough to permit relatively informal communication and decision making. In general, all personnel in the project were aware of the responsibilities, roles, and current priority items for the teachers, researchers and coordinators. At the beginning of the third year it became clear that for the 25 staff members to deal effectively with approximately 75 children and their families, 50 practicum students and a large number of visitors, an organizational structure was needed to coordinate these many activities and people. Consequently, the organizational structure depicted in Figure 2 was generated to coordinate the various services and research projects undertaken by the staff.

The project is composed of three basic units, the classroom, parent training, and research, each headed by a coordinator. Although each of these units functions as a separate entity, the director's role is to assure the necessary cooperation and interfacing of these units. The basic task is to assure that policies and activities generated by one unit are compatible with the other two units.

The classroom unit is headed by a coordinator who directs the service and research components of this unit. The service component

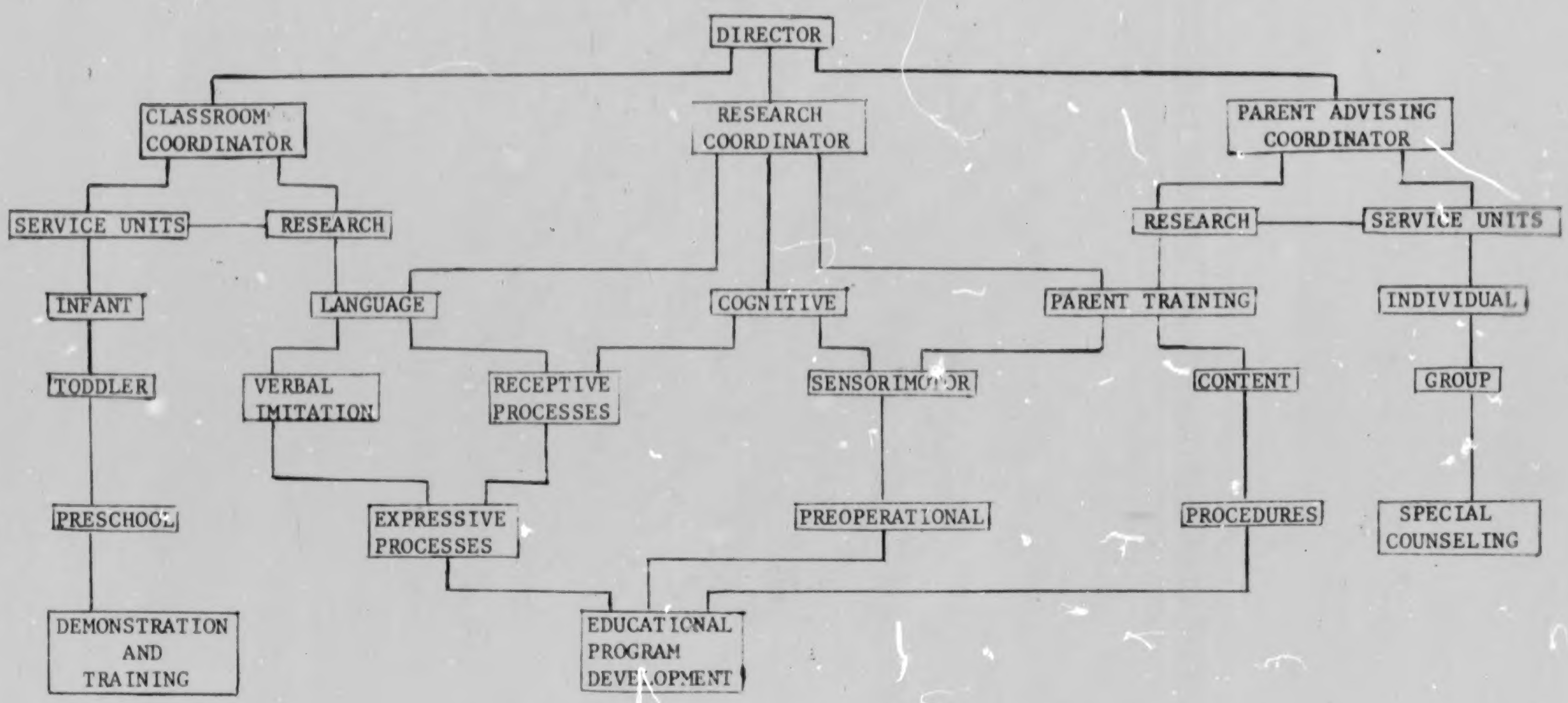
DIRECTOR
CLASSROOM COORDINATOR
RESEARCH COORDINATOR
PARENT ADVISING COORDINATOR
SERVICE UNITS
RESEARCH
RESEARCH
SERVICE UNITS
INFANT
LANGUAGE
COGNITIVE
PARENT TRAINING
INDIVIDUAL
TODDLER
VERBAL IMITATION
RECEPTIVE PROCESSES
SENSORIMOTOR
CONTENT
GROUP
PRESCHOOL
EXPRESSIVE PROCESSES
PREOPERATIONAL
PROCEDURES
SPECIAL COUNSELING
DEMONSTRATION AND TRAINING
EDUCATIONAL PROGRAM DEVELOPMENT

Figure 2. Organizational Structure of the Project

is composed of the infant, toddler and preschool classrooms each staffed with a teacher and an assistant teacher. Their basic responsibilities are to develop and implement the best educational program possible for each child enrolled in their class. The research conducted in this unit is focused on classroom training procedures and content particularly in the areas of language and cognitive development. The coordinator's role is to implement the research designs developed by the research unit within the context of the classroom as well as in special settings.

The parent training unit that was created this year is also composed of a research and service component. The research component is interested in generating data that will assist in developing effective training programs for parents and/or caretakers of young developmentally delayed children. Often the problems studied have been generated by the difficulties encountered by the parent advisers working on delivering services. The service component is divided into three basic resources for parents: individual training, small group training and special counseling for families which are having particularly involved problems. The staff for this unit is composed of three full-time parent advisers who do the individual and small group training, a social worker who handles the social services, two advanced clinical students who provide special counseling and a coordinator who supervises these varying activities.

The third unit is the research component and the major goal of this unit has been to investigate the various parameters of linguistic and cognitive development and training in delayed and nondelayed children. A second important goal has been to explore techniques for training parents to become more effective teachers with their children. Communication with the other units is of particular importance in order to ask and answer questions that have direct relevance to education of the parents and children involved in the project. When a specific training procedure breaks down, the research unit is consulted concerning several options that exist. The problem can be studied under more carefully controlled conditions, modification can be made within the present setting, or the procedure can be tried with a different population. The research unit assists in making these judgements in cooperation with the classroom and parent advising units. The staff of the research unit is composed of professionals trained in linguistics, special education, psychology as well as several research assistants who carry out the actual data collection.

The Kennedy Center Experimental School in which the project is located provides a superordinate administrative structure. The director and her staff are responsible for arranging transportation and food services as well as coordination and execution of the many administrative responsibilities and details of a project of this size. Their assistance during the past year has been extremely valuable and because of their effort the classroom, parent advising and research units have been able to function efficiently and concentrate on their primary objectives.

Physical Setting and Children

General Physical Setting

The project has been located in the Experimental School of the John F. Kennedy Center for Research on Education and Human Development, Peabody College, Nashville, Tennessee for the past three years. This year the project has expanded to three classrooms and additional research space. Figure 3 presents a schematic of the physical setting. As can be seen in this figure the preschool and toddler classrooms are adjoining while the infant room is separated by the parent reception area. Each classroom has an observation area so that parents, staff and visitors have access to the classroom. Each classroom has access to the outdoors including a play ground located to the north side of the building within easy reach of all classrooms. Located on the same floor are ample experimental and testing areas as well as special purpose rooms such as the kitchen, gymnasium, conference and first aid rooms. Each area is properly equipped for a preschool population.

Population Description

The infusion of title 4-A funds has allowed not only for a significant increase in size but for a significant shift in the nature of the population of parents and children served by the project. Originally we were able to serve only delayed and

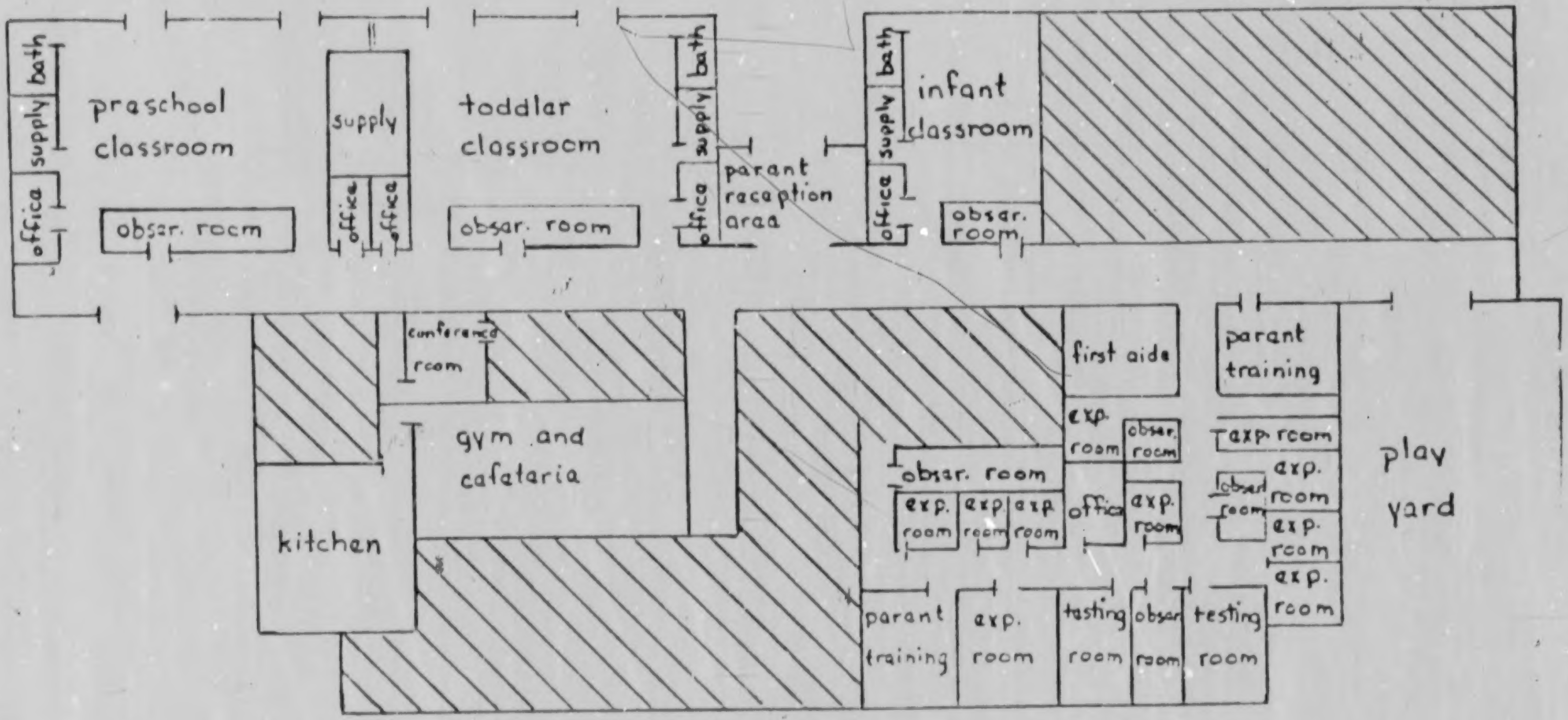
office
supply
bath
praschool classroom
obsar. room
supply
offica
offica
toddlar classroom
obsar. room
offica
supply
bath
parant racaption araa
offica
supply
bath
infant classroom
obsar. room
conference room
gym and cafataria
kitchen
first aide
exp. room
obsar. room
obsar. room
exp. room
exp. room
exp. room
offica
exp. room
parant training
exp. room
obsar. room
exp. room
exp. room
exp. room
parant training
exp. room
testing room
obsar room
testing room
play yard

Figure 3. Schematic of the physical setting of the classrooms, research laboratories, and ancillary service areas.

nondelayed children whose parents could provide transportation to the center. Title 4-A monies were intended to provide services for low-income children which has allowed the inclusion of an entirely new group of children. We chose to contract with the Department of Public Welfare to support approximately two-thirds of the children in the program so we could continue to include a number of delayed children whose parents' income was over the specified guidelines. We felt it was unfair to exclude these children from the program because a limited number of facilities currently exist in the community for the education of these youngsters and their families. Consequently, our population can be divided into four basic groups: 1) low-income normal developing children, 2) low-income developmentally delayed children, 3) middle income or above normally developing children, 4) middle income or above developmentally delayed children. The population has shifted from dicotomous groups of delayed and nondelayed children from similar economic backgrounds to a group of children representing a continuum of developmental and economic levels.

Table 1 presents demographic information concerning children who have been in the infant, toddler, or preschool units for at least six months. As children enter the project they are assigned to one of the classroom units and the Cattell Scale of Infant Intelligence or the Stanford-Binet (Form L-M) is administered. If possible each child is tested on subsequent occassions to keep the descriptions allowed by these measures current. However, for

Table 1

Demographic Information on Infant, Toddler and Preschool Children

	INFANT		TODDLER		PRESCHOOL	
	Delayed	Nondelayed	Delayed	Nondelayed	Delayed	Nondelayed
CA (Months)						
Mean	20.8	8.0	28.1	25.0	47.0	38.0
Range	7.5-27.0	3.2-13.0	12.0-44.0	15.0-37.0	36.0-64.0	21.8-55.0
IQ *						
Mean	47	84	42	94	57	106
Range	31-68	72-119	31-67	71-145	38-70	72-167
SEX						
Male	4	2	8	12	9	13
Female	2	3	2	8	8	4
Yearly Family Income						
< $3500.00	2	3	2	9	5	11
3500.-9000.	3	2	5	7	8	3
> 9000.	1	0	3	4	4	3
Etiology						
Downs	2	1	3	1	8	0
Robinow	1	0	0	0	0	0
Hydrocephalus	1	0	0	1	1	0
Spina Bifida	0	1	0	0	0	0
Language Delay	0	0	0	1	1	2
High Risk	2	3	7	0	7	0

*Cattell Infant Intelligence Scale or Stanford-Binet (L-M) several reasons standardized measures are not used as criteria by which the effectiveness of the program is evaluated. First, as Haywood (1971) and Haywood and Filler (in press) have pointed out, standardized measures of intelligence may provide relatively good predictions of academic achievement however, the prediction of academic success is not the goal of our project. Second the unreliability of infant intelligence tests is widely accepted (Gallagher & Bradley, 1972; Stott & Ball, 1965) and this unreliability is probably compounded when testing developmentally delayed children. Third, the project has no nonintervention control group therefore no basis exists for comparing gains made by our children until they reach first grade.

Description of the Major Components

For ease of presentation the project has been divided into four basic components: classroom, parent advising, demonstration and student training and research. In the following sections the goals, operational procedures, activities and staff roles for each component will be discussed.

Classroom Component

The classroom component provides educational-intervention services on a four-day-week two classes per day basis. The morning group attends Monday through Thursday from 9:00 AM to 11:30 AM and the afternoon group attends the same days from 1:30 PM to 4:00 PM. Fridays are reserved for in-service training, material and methods development, and program evaluation and revision. The daily schedule of each unit adheres to a different format. There are four general goals which underlie the various classroom units. The four goals are: 1) to meet individual needs of the children through objective-based programming and training 2) to reinforce and maintain the appropriate cognitive, social, linguistic, and motoric behaviors presently within each child's repertoire 3) to introduce and shape new and necessary cognitive, social, linguistic, and motoric behavior to become part of each child's repertoire and 4) to aid parents in building and maintaining necessary self-help skills. During the summer semester of this year renewed emphasis was placed on objective based education. The more general goals, previously listed, were refined to behaviorally specific objectives with attendant criteria. Prior to using these objective based activities in the classroom, the teachers planned flexible programs for presentation. At the end of each day the teaching staff evaluate the success of each activity based on whether or not the objective was met. If the objective was not met an analysis is performed to determine if teacher behavior, programmed presentation, or material suitability could be modified to increase the probability of success in the future.

Each of the three classroom is staffed by a teacher with either a Master's degree or Bachelor's degree with certification in Special Education, and an assistant teacher. Parents and practicum students, who operate under the direction of the teacher, constitute an additional part of the classroom staff. The classroom coordinator functions across the three classrooms to see that activities are coordinated, children recruited, program assistance is provided for the teacher, and evaluation is implemented at all levels.

The infant classroom has approximately ten children enrolled in the morning program and ten enrolled in the afternoon program. Depending upon the age, needs of the child and the wishes of the parent, the baby may attend on a regular basis all day, half-day or once a week. Babies or children in this unit range in developmental age from approximately three to 18 months. The chronological ages of the children range from approximately three to 30 months. These children are predominately delayed. The specific goals of the program in relation to the infant unit are: 1) the creation of individual programs to develop the child's competencies in the areas of gross motor skills, fine motor skills, sensorimotor, self-help and social skills, 2) the operationalization and empirical validation of such concepts as causality, means-end, object permanence, imitation and functional usage, 3) the development of a library of video tapes of infant behavior to be used for research, teaching and parent training and 4) providing each child with certain prerequisite forms of behavior necessary for adaptive functioning in the toddler unit.

Due to the nature of the programming and the age of children served by the infant unit, the daily schedule remains purposefully flexible and adaptive. Each child's program includes work in sensorimotor, gross and fine motor, social and self-help skills. Typical intervention periods run from three to five minutes followed by rest or free play with a variety of stimulating toys and equipment. The total amount of time spent in direct intervention varies within and across infants depending on the complexity and difficulty of the daily program and the child's interest and abilities.

The toddler classroom has 15 children enrolled in both the morning and afternoon classes. Approximately half of these children are developing normally while the others exhibit developmental delays. Children in this unit range in developmental age from approximately 12 to 40 months while chronological ages range from approximately 16 to 45 months. The specific goals for this unit are to provide each child with: 1) daily group or individual language training, 2) individually programmed gross and fine motor activities, 3) the opportunity to engage in self-directed activities, 4) a consistent environment which is established and maintained through the application of contingency management techniques, 5) opportunities to develop appropriate cognitive skills such as labeling, problem solving, and concept formation, and 6) adaptive skills necessary for entrance into the preschool unit.

The Toddler unit introduces the child to a more structured time schedule which is intended to help provide consistency in the classroom environment. A typical list of the daily activities for children included in the Toddler unit is presented below.

Opening Group Time Morning 9:00-9:15 Afternoon 1:30-1:45

1. Seat children in chairs.
2. Say "Hi" to each child and elicit a response--"Hi," wave, eye contact.
3. Sing songs.
4. Practice motor imitation, e.g. touch feet, clap hands.
5. Have children push their chairs to the tables.

Puzzle Time Morning 9:15-9:30 Afternoon 1:45-2:00

1. Seat children in their chairs.
2. Give each child a puzzle.
3. Prompt child to remove pieces.
4. Prompt child to replace pieces.
5. Prompt child to return puzzle and get another.

Programs Morning 9:30-10:45 Afternoon 2:00-3:15

1. Each teacher takes her first group to the assigned area and begins work on the program.
2. When the first group is finished, tell the children they may play; find the children in the next group, take them to the assigned area and begin on the program.
3. Continue with each group on the schedule until all children have been through the program.

Free Play Morning 9:30-10:45 Afternoon 2:00-3:15

(For children when not involved in a program)
1. Tell a child to find a toy--prompt if he does not or suggest an activity--slide, boat, housekeeping.
2. Move around the room giving attention to each child.

Gym Time or Outside Morning 10:45-11:10 Afternoon 3:15-3:40

1. Announce that it is time to put away toys and go to the gym or playground.
2. Prompt children to pick up toys and put them away.
3. Have children gather at door.
4. When leaving the room have one teacher go first, one teacher help non-walkers, and one teacher check to make sure that all children get to the gym.

Activities in the Gym or Outside

1. Riding tricycles and any non-pedal toys
2. Playing with balls
3. Jumping and rolling on mats
4. Running
5. Games (Ring around the roses)

Juice Time Morning 11:10-11:20 Afternoon 3:40-3:50

1. Seat children in chairs.
2. Elicit appropriate responses from each child before giving him juice.
3. Take the cup when a child is finished.

Closing Group Morning 11:20-11:30 Afternoon 3:50-4:00

1. Sing songs.
2. Practice motor imitations.
3. Beginning at one end of group instruct each child in turn to say good-bye to the child seated next to him.
4. Have children say good-bye together.
5. Tell children to get their coats.

As in the toddler classroom the preschool unit has approximately 15 children enrolled in both the morning and afternoon classes. Again approximately half of these youngsters are functioning within the normal developmental range while the remaining children are functioning significantly below their expected developmental level in several critical skill areas. Children range in developmental age from 36 to 45 months and chronological ages range from approximately 36 to 60 months. The specific goals for this unit are to provide each child with: 1) the opportunity to develop pre-operational cognitive skills, 2) opportunities to further develop and refine more difficult self-help skills, 3) opportunities to develop increasingly independent task behavior without teacher supervision or continuous reinforcement, 4) opportunities to correctly articulate two word phrases and 5) certain prerequisite or useful early elementary education skills.

In an effort to assist the child in developing realistic adaptive school skills, the Preschool unit provides even more of a supportive time environment than either the Infant or Toddler units. A list of representative daily activities is presented below.

Opening Group Time Morning 9:00-9:15 Afternoon 1:30-1:45

1. Children get rugs and seat themselves in a semicircle.
2. Teacher greets child seated next to her and requests that child greet the child next to him by name, continue until everyone is greeted.
3. Activities for this period include felt board, matching games, discrimination exercises, and imitation songs or games.
4. Children are directed to appropriate small group for next activity.

Language and Concept Training Groups Morning 9:15-9:50 Afternoon 1:45-2:20

1. Each child attends two small group sessions during this period, a language and a concept training group. Usually the group composition is the same for both activities.
2. Activities include: matching, discrimination, naming and imitative tasks.

Snack Time Morning 9:50-10:00 Afternoon 2:20-2:30

1. After each child has put away his materials from small group activity, the snacks are brought to the table.
2. An appropriate response is elicited from each child before he receives a snack (i.e. labels food correctly).

Story Time or Quiet Games Morning 10:00-10:20 Afternoon 2:30-2:50

1. After finishing their snack and helping to clean up, each child is allowed to select a toy for a brief period of free play.
2. Children are offered opportunity to use toilet during this period.
3. Children sit together to hear a story or play a game.

Outdoor Play or Gross Motor Activities Morning 10:20-10:50 Afternoon 2:50-3:20

1. Children line up to go to playground, or to gym.
2. Activities outside include: play on equipment such as swings, play in sandbox, or simple group games.
3. Activities in gym include: trampoline, movement through obstacle courses, relay races, simple exercise and games.

Art or Fine Motor Activities Morning 10:50-11:15 Afternoon 3:20-3:45

1. After returning from previous activity, children are directed to chairs.
2. Children are given various activities designed to develop fine motor coordination.
3. Activities during this period include: stringing beads, placement of pegs in pegboard, painting or drawing and use of scissors.

Closing Group Time Morning 11:15-11:30 Afternoon 3:45-4:00

1. Review days activities.
2. Sing songs or play imitation games.
3. Say good-bye.

The daily schedule provides opportunities for children to participate in a variety of activities and social situations. In each type of activity the response expected of the child is based upon the child's competencies. In the large group opening and closing times, when motor imitation and following directions are emphasized through the use of action songs, the teacher attempts to individualize the commands according to each child's capabilities. The small groups offer an opportunity for grouping children together on the basis of their level of functioning. Children who need programs in receptive vocabulary on the same level of difficulty are grouped together. Placements are flexible however, so that if one child makes faster progress than another, that child may move to a different group. If a particular child needs individual programming in a particular area, he will be given individual work and moved into a group when his level of performance makes that possible.

Parent Advising Component

In September, 1972 a parent training system was formally implemented within the project. Before this time parent training was conducted on an informal basis and carried out by researchers and teachers. However, with the advent of the parent advising component, staff were hired whose primary responsibility was the provision of educational and social services to the families of children involved in the classrooms. Although the three parent advisers were all at least bachelor's level, none had been trained in special education, social work, behavior modification or parent education. Consequently, this new staff was provided with extensive in-service training in these domains. In addition to the parent advisers, one full-time social worker was hired to serve as a consultant to the parent advisers and to assume responsibility for families in need of substantial social services.

The primary goal of the parent advising component is to provide a system of training for parents which will enable them to serve as effective educational change agents with their children. Emphasis is placed on teaching parents behavior modification techniques which can be used to instruct children on a wide variety of tasks. Rather than focusing on behavior control or management, as has been most often done with parents, the training has focused on developing behavior shaping skills (e.g., breaking a task down into small steps).

A secondary goal of this component is to teach the parents to be educated consumers of the services either educational or social provided for their children. Emphasis is placed on educating parents as to the needs of their children and how to evaluate whether the needs are being met. Parents have, for example, visited one of the local schools designated for trainable level children and then discussed the kinds of activities they saw being conducted with the children and whether or not they felt this would be appropriate for their child. Literature on programs for delayed children is available for parents and group meetings are spent discussing normalization and the types of community changes necessary to make this a reality. The parents have been kept informed of the federal funding situation and how this might effect their child as well as how they can have a voice in determining how funds shall be allotted and spent. In essence, the parent advisers have attempted to give the parents the information necessary for them to mobilize as a citizens group concerned about the opportunities available to the handicapped children.

Finally, by the middle of the first year of operation the parent advisers realized the necessity of exploring, with at least some families, the impact of having a delayed child. That is the parent advisers realized they needed skills other than behavior modification techniques in order to deal effectively with families. Presently the parent advisers are being trained in communication and listening skills by a counseling psychologist. An eventual goal is to train the parents themselves in these skills so they can more effectively deal with their various feelings about having a handicapped child as well as crises centered around the delayed child if they arise.

The parent advisers assume five major responsibilities in relation to the goals previously discussed. First, the parent advisers are responsible for over-all training of parents in behavior modification techniques as applied to the teaching of language, motor, self-help, cognitive and behavior management skills. Second, they assume responsibility, along with the social worker, for insuring that families have acquired any social service assistance that is necessary. This includes arranging necessary transportation for medical visits and trips to pick up food stamps, acquiring clothing and shelter for the family and arranging protective service for the children if necessary. Third, parent advisers are also responsible for insuring that classroom training programs are carried over into the home. Home visits are generally made every four to six weeks, particularly if a parent cannot come into the center. Telephone contacts are often maintained on a weekly basis. Fourth, parent advisers, in their contact with parents, are responsible for fostering the parent's confidence in their ability to become the instrumental change-agent in their child's environment. Rather than serving as dispensers of knowledge or "experts", the parent advisers serve as teachers and are responsible for structuring training such that parents acquire the necessary skills for dealing effectively with their children. Finally, the parent advisers act as resource persons for the parents in terms of educational materials and current research in the field of mental retardation.

During the first year of operation, the parent advising component shifted from exclusively group based form of parent instruction to a combination of small group and individual instruction. The families primarily served within the educational system have developmentally delayed children. Generally mothers of delayed children have been requested to spend at least one morning or afternoon a week at the center. If a child's mother worked, she either came in on her day off or if this was not possible, home visits were arranged.

Mothers were trained in four major skill areas which correspond to the classroom curriculum areas. These areas were language, cognitive, motor, and social development. Depending on the developmental level of the child, the mothers were generally involved in one or two areas at a time. For mothers with children in the toddler and preschool units primary emphasis was placed on language. For mothers of children in the infant unit primary emphasis was placed on cognitive development and focused, more specifically upon the sensorimotor curriculum and imitation skills. Each of the skill groups met once a week.

The social development skill group was divided into two areas: self-help skills and behavior management. The self-help group focused mainly on spoon feeding and cup drinking with the infants, toilet training with the toddlers, and dressing with the preschoolers. Initially, mothers working on these skills met in small groups with a parent adviser but later met with a mother who assumed responsibility for training the other mothers. The group was used to target behavior, discuss training strategies and evaluate data in the form of weekly probes collected by the mothers. In addition to the group meetings mothers conducted demonstration sessions for the trainer and themselves. These sessions were used to evaluate the mother's effectiveness in following program procedures with the emphasis on the improvement of shaping skills.

The behavior management group generally contained equal numbers of mothers of delayed and nondelayed children. Problems in home behavior, such as tantrums and toy throwing were the general focus. Each mother targeted the problem, collected data, and intervened on one inappropriate behavior at a time. The group meeting time was spent evaluating the success of the intervention and discussing "discipline" in general.

The motor development skill group met once a week with a parent adviser and was also divided into two major areas. Mothers in the gross motor group worked primarily on either walking (infants) or climbing (toddlers). Group time was used to target behavior and discuss teaching strategies. Training sessions on walking were conducted by the mothers each time they were at the center. Demonstration sessions on climbing were conducted weekly and evaluated by the parent adviser. Mothers in the fine motor group worked primarily on skills such as buttoning and lacing. The overall structure of training was the same as for the gross motor group.

The cognitive development group met once a week with two parent advisers and primarily involved mothers of infants. The parent advisers were responsible for explaining the classroom sensorimotor curriculum to the mothers and demonstrating the procedures for training in the various areas. Videotapes of teachers conducting training sessions were also employed. The mothers conducted training sessions with their infants at least once weekly at the center with the parent advisers acting as supervisors or trainers. Infant mothers' group meetings were also used to discuss other classroom programs and general principles of growth and development. Infant mothers were involved in classroom activities each time they came into the center.

The language group met once a week and included the majority of the mothers of infant, toddler, and preschool children. The first half-hour of the meetings was set up as a general forum with the classroom coordinator discussing general classroom procedures and programs with the mothers. During this time relevant films, videotapes and written materials were discussed or presented to the mothers. After the general forum the mothers went to one of three smaller groups depending on the developmental level of their child. These groups were functional/receptive, imitation/expressive, and syntax. These areas corresponded to the target training areas of the classroom language program. The model used to teach the mothers how to conduct home training sessions was a replica of the classroom program. Videotapes of laboratory training sessions were used to demonstrate teaching strategies in the areas. Mothers worked with their own children in groups of two. These sessions were supervised by the parent advisers and, where appropriate, by the speech pathologist.

During the summer a pilot language program was initiated in which mothers carried out language training in the classroom. Three days a week mothers and parent advisors conducted supplemental classroom language sessions. Mothers worked with their own children and also with other children. The goal of the pilot program was to better coordinate the classroom and home language training programs as well as to provide better feedback to mothers concerning the implementation of the language curriculum. Eventually we hope that mothers will be able to train new mothers in the use of the language training program.

Supportive social services were provided to all families in the project who required them. Since the majority of families with nondelayed children and some of the families with delayed children met low-income guidelines as established by the Tennessee Department of Public Welfare, social service demands were substantial. Each parent adviser and the social worker carried a case load of approximately 20 families. They were responsible for providing home visits and social services to these families. If the family unit had children not enrolled in the project, the parent advisers were responsible for insuring that these children also acquired any needed services.

In general, an attempt was made to provide preventive rather than crisis intervention social service. For example, mothers were encouraged to take their children to public health clinics for regular medical check-ups in addition to the check-ups which were provided during the summer by a medical team at the center.

Similarly dental and eye check-ups were arranged for all low-income children enrolled in the program. Consultation with protective services was conducted whenever child neglect or abuse was suspected. In cases where children were in foster care, but return to the home environment was likely, the parents as well as foster parents were involved in the project.

Demonstration and Student Training Component

As noted in Figure 3 each classroom has observational facilities, consequently we can accommodate visitors during the entire time the classes are in session. During the past three years visitors have ranged from interested parents to the Governor of Tennessee and a United States senator. The staff attempts to provide an orientation for as many visitors as possible but because of limited resources we cannot accommodate all the requests for viewing the project. The staff views the demonstration capability of the project as an important function especially for those individuals directly engaged with intervention programs for low-functioning children. Although many programs for low-functioning children exist in the country, most professionals would question the adequacy of these programs. We feel that demonstration of behavior management, educational programming and effective integration of delayed and nondelayed children in a somewhat traditional classroom setting may often have a more profound effect than yards of reports and tons of data. Consequently, we intend to keep the project open to as many relevant visitors as possible. Parenthetically the staff often benefits from the questions, observations and comments offered by our visitors.

Student Training

Since the inception of this project, students at all levels of training have been included as a necessary part of the project.

Only through the use of practicum students can we possibly carry out the individual programming used extensively in each of the classrooms. If one is to rely heavily on students, one must be prepared to provide functional training and a back up resource system. We have spent much time and effort in attempting to generate an effective in service or pre-service training program and a subsequent support system for the students placed in the classrooms. We have not only been concerned with training a student to operate effectively within our program but to develop procedures, content, resources, educational strategies and behavior management techniques that will allow students to operate as effective teachers in other settings with a variety of children. To this end we have employed the training program outlined below.

As discussed in the reports from Years I and II, the student training has evolved through several phases and during this year we continued to follow the basic procedures outlined in the Year II report. An in-service training program is presented covering the areas of: the structure of the project, behavioral objectives, behavior control techniques, classroom procedures, and practicum goals. The student is given a pretest before the in-service training and a posttest following it in order to ascertain whether the material covered has been absorbed by each student.

Once the students are placed in the classroom they have two basic responsibilities. First, they are to act as assistant teachers in implementing the daily classroom program and second they have to collect and use data to develop specific training programs for an individual child. After completing the data collection, the student must analyze the data and write an evaluation of the program.

During the time the student is in the classroom, the teacher provides as much monitoring and feedback as possible; however, this system has not been completely functional and we are anticipating some basic changes in the student training for Year IV.

Research Component

The research goals of this project are ambitious but the problems that confront us are enormous. We no longer consider it acceptable to place children in institutions or even to provide only custodial care in community based programs. In fact many of us are critical of those programs which have as their only goals and objectives, teaching low-function children self-help and busy-work skills. Surely these children have limitations but we have only begun to explore the possibilities that exist in terms of their possible developmental progress. Our superordinate research goal is to develop educational programs that will maximize the development of this hetergeneous group of children in all critical domains of behavior. Specifically we have three major areas of research: language, cognition, and parent training. Within these areas studies have ranged from investigations of specific variables in a controlled laboratory setting to examinations of the effect of a training program on a large number of children. Summaries of the research conducted in the project during the third year appear below.

Sensorimotor Research

This section of the report provides a brief description of the sensorimotor research projects which have been conducted during the last year. As indicated in the Introduction our approach to the study of this early human development has been influenced primarily by the work of Piaget and his collaborators. From the perspective of the development model, later complex forms of behavior are dependent upon the acquisition of a repetoire of skills achieved early in the developmental sequence. Although Piaget has provided a detailed description of the achievements which occur during the sensorimotor period, behavioral specification of developmental steps is far from complete. Current assessments derived from Piaget's theory have, for the most part, only indexed terminal states and large intermediate steps rather than measuring a continuum of development with respect to major areas such as object permanence, means-end and causality relations and the construction of space. In addition, there has been a tendency to neglect the evaluation of the effects of situational factors, such as materials employed and social context upon child performance. The studies described in this section were addressed to the above considerations. These investigations are viewed as initial attempts at providing a more precise specification of developments in the sensorimotor period with the ultimate goal of establishing effective training sequences.

Study of Sensorimotor Development in Young Developmentally Delayed and Nondelayed Children

C. Robinson, G. Chatelanat, S. Spritzer, M. Robertson and W. Bricker

Recently a great deal of interest in Piaget's descriptions of infant development has been evident particularly in the early intervention literature. Several assessment scales based upon Piaget's writings have been developed such as the Infant Psychological Development Scale (Uzgiris & Hunt, 1966) and the Albert Einstein Scales of Sensorimotor Development (Escalona & Corman, 1969). A particular advantage which we see in the Piagetian descriptions of sensorimotor development is the detail which they provide with respect to developmental sequences. The Piagetian based scales are assumed to be ordinal in nature and potentially offer an outline of the requisite skills a child is likely to need in order to demonstrate a particular behavior. In addition they offer a programmatic sequence which may be empirically evaluated.

Our work in the area of sensorimotor development has focused on the evaluation of an assessment instrument which we hope will enable us to index the sensorimotor abilities of both delayed and nondelayed children. In addition, the assessment instrument may be used to monitor the effectiveness of the classroom activities designed to facilitate the development of sensorimotor concepts (e.g., object permanence or means-end relationships) in young developmentally delayed children.

The present investigation represents an initial effort to develop a reliable assessment instrument of sensorimotor development which can be administered quickly. The subjects in this investigation were 54 children enrolled in the project. Thirty-nine of the children were identified as developmentally delayed (intelligence quotients below 80 on the Cattell Infant Intelligence Scale or the Stanford Binet). The remaining

15 children were classified as developmentally nondelayed and had scores of 95 or above on the Cattell or Stanford Binet.

The sensorimotor assessment consisted of 31 items from the Infant Psychological Development Scale (Uzgiris & Hunt, 1966) and the Albert Einstein Scales of Sensorimotor Development (Escalona & Corman, 1969). Items adopted from these scales were selected to represent three major areas of sensorimotor development; object permanence, development of means-end and causality relationships, and development of spatial relationships.

The items represented in their respective category are:

Object Permanence Assessment

1. Partial displacement made by moving a cover from a partially hidden object. This is scored as a pass only when the child moves the screen in order to get the object.

2. Single visible displacement when only one cover is used but the object is completely hidden from view. Child must take the object when it is uncovered.

3. Single visible displacement using two screens (covers) with placement of the object alternated in a random pattern. Can be used to detect position preferences and other position strategies.

4. Sequential visible displacement through three screens which makes any of the three positions possible on any trial and and can be used to differentiate last found from last seen strategies.

5. Invisible displacement screen in which the hand is closed keeping the object from the view of the child as the placement is made. This item can be used to differentiate children who have last seen strategies but who will not search systematically when the situation becomes perceptually ambiguous.

6. Invisible displacement through two identical screens which can be used to further differentiate children who search systematically from those who search in an ambiguous situation but repeat an error or two in the process.

7. Sequential invisible displacement through three screens which simply adds complexity to the invisible two screen item.

Means-Ends Assessment

1. Child shifts position to obtain an object that is out of reach.
2. Child pulls a string attached to an object laying on a table or other horizontal surface.
3. Child pulls a pillow or cloth to reach an object laying on the pillow or cloth.
4. Child removes or detours around a transparent obstacle to obtain an object that is otherwise in reach.
5. Child pulls a string attached to an object that is beside the child and requires vertical movement of the string to get the object.
6. When an object is held about four or five inches above a pillow or cloth, the child attempts to get the object by direct reaching, gestures, or verbal request but does not pull on the pillow or cloth.
7. Child uses a stick or other tool that is in reach to obtain an object that is out of reach.

Physical Causality Assessment

1. Child examines a demonstrated mechanical toy but does not attempt to either manually reproduce the action or activate the toy.
2. Child makes the toy work manually rather than through the use of the windup key or other activating mechanism.
3. Child searches for and touches activating mechanism but is not able to make the toy operate.
4. Child is able to operate toy using the activating mechanism after given a demonstration of the activation process by the tester.
5. Child activates mechanism so the toy operates properly and he does so without demonstration.
6. Child demonstrates foresight by being able to put a string of beads into a tall narrow container by adjusting the beads prior to insertion.
7. Child demonstrates foresight by discarding solid ring in a seriation task after having placed several rings on a seriated sequence post.

Tracking and Spatial Relationships Assessment

1. Child turns and focuses on an object held outside his visual field when the object (rattle, bell, etc.) makes noise.

2. Child looks to other end of an opaque screen when a slowly moving object which he was tracking is passed behind the screen.

3. Child follows the trajectory of a rapidly moving object to its point of disappearance and then moves to look for it.

4. Child places a number of objects in a container and then turns the container over to remove the contents when the container and object are presented. If child does not do this spontaneously, present the container with the object in it to the child, but do not permit him to see this being done. This may also be done with a pellet and small bottle.

5. Child permits an object which has prolonged activity to execute its action independent of his assistance (i.e. allows friction toy to roll along floor), after E demonstrates the toy's action several times.

6. Child permits a friction toy to roll down an incline plane.

7. Child moves his entire body (creeps or walks around a barrier) and retrieves a visible object. The object should be placed in a location so that the shortest route to retrieving it would be to move in the opposite direction of the object's location.

8. Child moves around a person or another barrier to obtain an object removed from his visual field.

9. Child succeeds in placing at least one nested cup into another.

10. Child can move around barrier that blocks him on three sides.

11. Following a demonstration of pushing an object through a tube with a stick and retrieving it at the other end, the child sights object in tube, pushes it through with stick and moves to opposite end to retrieve the toy.

Each child was tested individually in at least three sessions of approximately 15 minutes each. Three trials were given for each item, and in order to pass an item a child had to demonstrate the criterion behavior on at least two of the three trials. An experimenter and observer independently scored the child's response during all sessions. Praise and physical contact, such as hugging, were used to maintain the child's behavior. Each child was presented with the items on each scale until he failed five consecutive items or completed the scale. Four people participated in the administration of the assessments and all possible experimenter-observer combinations were used.

Interrater, split-half and test-retest reliability estimates were obtained for the assessment. Item interrater reliability was based upon the percent agreement of the two raters summed and averaged across subjects who received that item. These values ranged from .82 to 1.00 with a mean of .99. The split-half reliability analysis was based upon the first observer's scores for each item and involved a comparison of odd versus even numbered items, as the items are presumed to increase in difficulty within each scale. The split-half reliability estimate was .94. The corrected estimate using the Spearman Brown prophecy formula was .96. This coefficient of reliability suggests that a shortened version of the scale, which consisted of half of the items, could be administered in cases where a screening assessment of a child's sensorimotor performance is desired.

A Pearson product moment correlation of .96 ($p<.001$) was computed on the total test score for two administrations of the sensorimotor assessment with a subgroup of nine delayed infants. The administrations occurred approximately three weeks apart. It should be noted, that this represents the stability of the assessment for only a portion of the population with which the test has been used in this investigation.

Correlations between sensorimotor performance scores and the demographic variables mental age, chronological age and intelligence quotients were obtained for the delayed and nondelayed groups of children. The obtained correlations between the sensorimotor assessment scores and CA and MA were .82 and .92 for the delayed and nondelayed children respectively (all correlations were statistically reliable $p<.001$). The correlation between sensorimotor performance and IQ was not significant for either group. The relationship between sensorimotor performance and CA is shown in Figure 4. (It should be noted that each point in the figure represents a different number of children). The figure indicates that the delayed children eventually attain the same level of performance as the nondelayed children at approximately twice the chronological age of the nondelayed children.

Comparisons by _t_ tests were made of mean sensorimotor scores for groups of delayed and nondelayed children matched on MA at two age levels 13 to 24 months and 25 to 36 months. In neither case were the means significantly different.

The results of the present investigation, including adequate interrater, split-half and test-retest reliability estimates for the assessment, seem to suggest that this instrument can be employed to provide a reliable index of the sensorimotor abilities of both delayed and nondelayed children. Future research will involve an evaluation of the effectiveness of utilizing the assessment to structure and monitor classroom activities designed to facilitate the development of sensorimotor concepts. Although a scalogram analysis could not be performed in this study because the sample of children assessed was not equally distributed across CA and MA levels, the programming implications derived from such an analysis would warrant additional research focusing on the sequential nature of the assessment. A final research direction will involve attempts to determine interrelationships between the various areas of sensorimotor development.

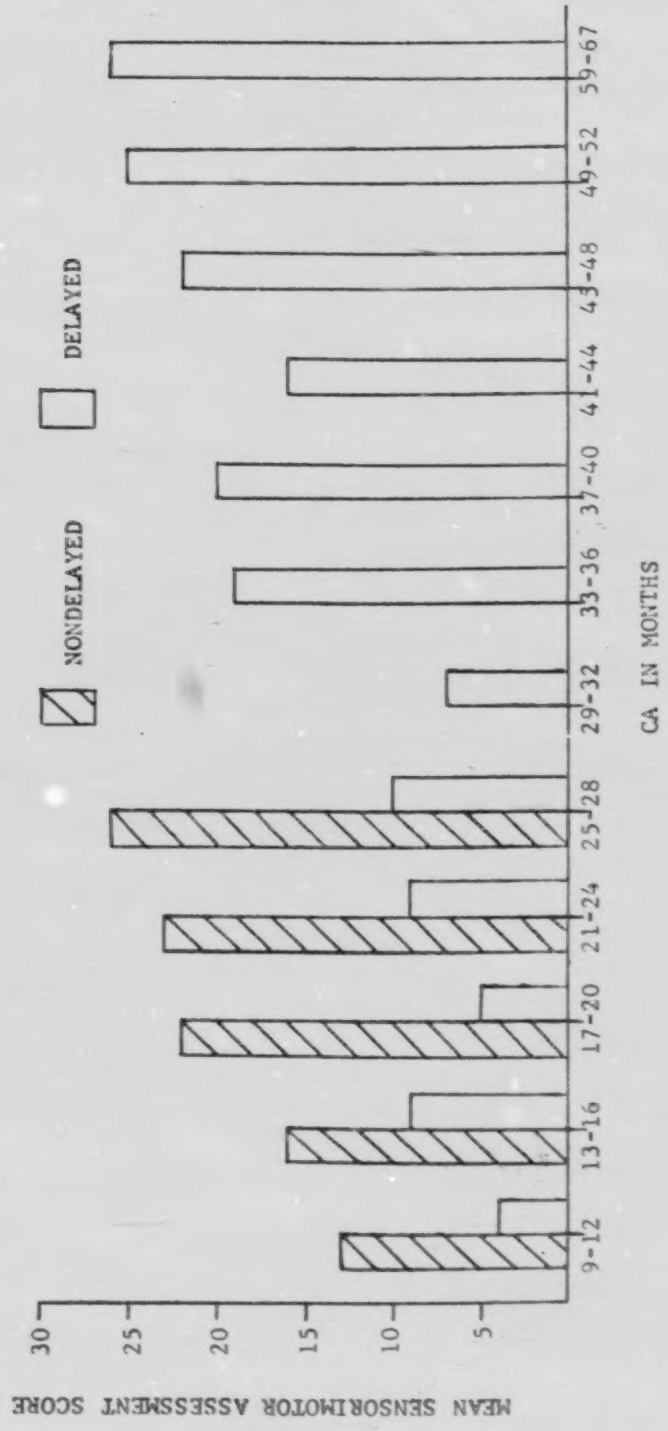

Figure 4. Mean sensorimotor assessment performance for delayed and nondelayed children across chronological age levels.

The Objectification of Physical Causality

M. Robertson and W. A. Bricker

Piaget (1952, 1954) describes the objectification of physical causality as one of the important achievements of the sensorimotor period. He depicts the infant in the early stages of sensorimotor development as attempting to maintain or reproduce interesting behavioral and physical consequences by repeating specific gross motor movements, such as waving his arms and legs, which produced these consequences. For example, an infant in a crib to which a mobile is attached might observe the mobile moving as he rocks his body and, as a consequence might increase the rate or intensity of these movements and also smile, vocalize, or manifest other signs of pleasure. According to Piaget, causality for the infant at this stage resides in environmental consequences to his own movements rather than being controlled by the antecedent object stimuli. Thus the infant's behavior in this situation would be the same whether the mobile moved as a result of the infant's actions or was wound by another agent, such as the infant's mother. At the culmination of the sensorimotor period Piaget asserts that the infant will have objectified and spatialized physical causality in terms of complex control by environmental objects and events. In the case of the wind-up mobile, the infant would locate the key and wind it in order to make the mobile rotate again. Piaget has also described the intervening developmental stages with their representative behavior.

This study was an attempt to determine if children can be differentiated in terms of their efforts to activate a set of mechanical toys which produced interesting spectacles. These manipulations have been categorized according to Piaget's description of the behavior characteristic of successive stages in the objectification of causality. Table 2 presents the recording format drawn from Piaget's discussion, which was used in the study.

Twelve children from the Project's classrooms were selected for participation in the study. Chronological age range extended from 19 to 43 months (mean=32.2) for the five nondelayed subjects and from 25 to 69 months (mean=42.7) for the seven delayed subjects. The IQ range for all subjects was from 44 to 144 (mean=89). Diversity of MA and CA was sought to provide samples of behavior across the developmental continuum.

The subjects were taken individually into the experimental room, seated at a low table, and presented with a randomly ordered series of commercial toys which differed along two dimensions, type of manipulandum and immediacy of result. The toys were classified according to these dimensions in Table 3. Manipulations required of the subject were pushing, pulling or winding. The action might occur simulataneously with manipulation as with a simple pull toy, or it might occur when the manipulandum was released, as in the case of the string on the talking farm, or might be even less direct and immediate, as with a wind-up car which must be wound, then set on a surface and released before it operates appropriately.

Each toy was presented three consecutive times. In the first presentation, the unactivated toy was set before the child. In each presentation the subject was encouraged to manipulate the toy, and his responses were recorded by the experimenter and one observer, using

Table 2

Recording Form Used to Categorize Child's Responses to Toys Across Repeated Presentation

Response Categories	Presentations			Comments
	1	2	3	
Touches examiner's hand or object briefly after it stops or is placed before him				
Acts directly on object to repeat spectacle - i.e. pushes, slides, rocks, shakes (not nec. approp. schema)				
Examines object (focus is observation) looks while turning it over, fingers features, parts, brings to eyes, manipulation of parts				
Manually operates toy - pushes or slides w/out releases, guides, holds on, uses part to move whole, opens by hand (intr. in whole toy)				
Gives object back to E. - manipulates E's hand or returns object to be reactivated				
Experiments in order to see repetitive, variations on a theme, pleasure response to novelties				
Explores for a way to activate object - goal orientation, switches methods when don't work, frustration w/lack of success, places toy approp.				
Activates object successfully				
Allows object to operate independently after having successfully activated - removes hands				

Table 3

List of Toys Classified by Manipulandum

and Immediacy of Response

Toy	Manipulandum	Action	S[a]	P[b]	D[c]
jumping jack	pull string to move limbs	immediate	11	11	12
squeeze frog	squeeze bulb--frog jumps	delayed	7	9	9
pound around	push knob	immediate	6	7	11
talking farm	pull string for sound	delayed	11	10	11
clown in box	push button	immediate	11	9	10
bee	pull string	immediate	6	-	11
donald duck	pull string	delayed	7	8	7
battery truck	push switch	delayed	1	2	7
radio	wind knob apparent	delayed	8	9	9
friction frog	push (friction)	delayed.	4	6	7
Mattel truck	wind (key disguised)	delayed	3	4	8
fire engine	wind (key apparent)	delayed	5	6	5
walking fire engine	wind (key hidden)	delayed	5	6	6
grey mouse	wind (key removable)	delayed	1	5	6
antique car	push lever	delayed	5	5	7

S[a] Spontaneous manipulation by child.

P[b] Manipulation is produced by experimenter.

D[c] Manipulation is demonstrated by experimenter.

the recording categories in Table 2. In the second presentation, the activation of the toy was concealed from the child though he was permitted to see it in operation. Only one toy, the pull-toy Buzzy Bee, could not be presented in this manner. The procedure for activation was demonstrated for the child in the third presentation.

Subjects were ranked according to the number of toys successfully activated on the first presentation by using weighted scores. The weighted score was computed by figuring three points for each successful activation on the first presentation, two points for activation on the second presentation, and one point for activation on the third presentation. Spearman Rank Order coefficient of correlation between these two orders was .89, indicating a high relationship between successful activation on the first trial and subsequent trials. There appeared to be no significant acquisition across trials.

A Spearman Rank Order Correlation, performed to compare the frequencies of activation and use of alternative modes of manipulation yielded a coefficient of -.65 ($p < .01$). This result is consistent with the finding of lack of learning over trials. The picture presented by these data is of subjects typically confining their manipulation to activation on toys with which they were successful and employing a variety of alternative modes, including exploration for the appropriate means of activation, in cases where they were not initially able to activate the toy. That learning over successive trials did not occur indicates that the instrument is more sensitive to terminal behavior than to emergent behavior and suggests examination of the alternative manipulations as a direction for further investigation.

Computation of Pearson Product Moment correlation between MA and weighted score and CA and weighted score yielded significant coefficients of .54 ($p<.01$) between MA and the weighted scores and .65 ($p<.05$) between CA and the weighted scores. The correlation between CA and MA was not significant ($r=.37$). These results suggest that the complexity of operation of the various toys corresponded to a developmental progression. The nonsignificant correlation between MA and CA was the result of having wide MA range but a restricted CA range.

All but three nondelayed preschool subjects had received an administration of a modified sensorimotor assessment described elsewhere in this report. This assessment, which included six items relating to the objectification of causality, yielded an overall sensorimotor score which was compared to the weighted causality score. The Pearson Product Moment correlation coefficient computed between these scores was .68 ($p<.01$) suggesting a relationship between level of successful activation of toys and overall performance on the sensorimotor assessment. Since one section of the sensorimotor assessment probes a similar form of causality behavior, some relationship should be expected.

The objective of this study was to determine if children can be differentiated in terms of their successful activation of a set of mechanical toys. The results indicate that children can be classified along this dimension, permitting the focus to be shifted now to the manipulations executed by the child prior to or in the absence of successful activation as measures which might further differentiate the children in terms of subsequent training routines.

Assessment of Means-End Behavior with Delayed and Nondelayed Infants, Toddlers and Preschool Age Children

S. Spritzer

The present study involved the administration and evaluation of the means-end section of the Project's Sensorimotor Assessment. Several considerations formed the basis for a separate evaluation of this scale. One concern was to examine the possible relationships between the important areas of the sensorimotor period, such as object permanence, spatial relation, physical causality and means-end development. Although Piaget (1952, 1969) frequently has discussed the sensorimotor development in those major areas separately for heuristic purposes, he maintains that development in one area is related to development in the other areas. The generation of hypothesis about the existence and nature of these relationships seems to be an important endeavor, as has been pointed out in a recent study by Uzgiris (1973). Using the Uzgiris-Hunt assessment instrument (Uzgiris & Hunt, 1966), Uzgiris found significant intercorrelations between achievements of spatial relations and the use of means-end relations. These intercorrelations were found to cluster into three age periods, supporting Piaget's stage delineations. Uzgiris also showed that a step upward in object permanence leads the way for means-end development when visible displacement with several screens is involved. One purpose of the present study was to provide further information on the interrelationships between the different sensorimotor areas.

A second purpose of the present study was to determine whether responses to the means-end assessment indicated an ordinal sequence of the scale items. Information about the ordinality was sought, in part, because of the implications for the test-teach strategy in training programs. Knowledge of the child's position in a developmental sequence would potentially provide a basis for determining the appropriate subsequent training sequence. In addition, a sequential analysis of responses would indicate whether specific items or groups of items, assessed different levels of means-end behavior, from early forms of behavior to more sophisticated use of intermediaries.

Finally, a third purpose of the present investigation involved the comparison of groups of delayed and nondelayed children. This comparison was intended to investigate the extent to which qualitative and quantitative differences existed between delayed and nondelayed children. Obviously, this hypothesis has implications for the teaching of delayed children. If the same developmental pattern exists for both groups of children, then instruction would follow this sequence for both groups.

Subjects were 47 infants, toddlers, and preschoolers. Thirty-three of the children were identified as developmentally delayed (mean CA of 36.3 months and a mean MA of 20.3) and the remaining 14 children were classified as nondelayed (mean CA of 21.9 and a mean MA of 25.4).

Assessment took place in a secluded portion of the infant and preschool classrooms. The child was seated at a table with the experimenter seated opposite and an observer seated to one side of the child. An effort was made to interest the child in some toys before the assessment was begun.

The means-end assessment consisted of seven items selected from the project's Sensorimotor Assessment. The child was asked to obtain an object by: 1) reaching; 2) pushing aside a barrier; 3) pulling a string horizontally; 4) pulling a string vertically; 5) using a pillow; 6) reaching for an object when it is held above the pillow, and 7) using a stick. Other scales included in the project's Sensorimotor Assessment were also administered to the same subjects.

Items in the means-end scale were presented to the child in their assumed ordinal sequence. The scale was administered in its entirety unless the child failed three consecutive items. Each item was presented three times and scored as correct or incorrect. Two of three correct responses were necessary for an item to be passed. The experimenter and the observer independently scored each response. Item inter-rater reliabilities for the means-end scale were above .92.

The evaluation of the means-end scale by scalogram analysis and item analysis indicated ordinality and content validity for the scale. Green's index of consistency (Green, 1959) for the total group was .81, for the delayed group .77, and for the nondelayed group .41 (.50-1.00 indicates ordinality). The alpha reliability coefficient for the total group was .76. When the more homogeneous delayed sample was analyzed, alpha was .81.

A significant finding of the scalogram analysis was that delayed and nondelayed children did not exhibit different developmental patterns. This finding supports the hypothesis that delayed children seem to follow the same developmental sequence as nondelayed children.

In examining the interrelationships between areas of development, a regression analysis using the means-end score as criterion and spatial relations, object permanence, and physical causality scores as predictors indicated that the only significant scale predictor was spatial relations

($p < .01$). Since all but one of the means-end problems involved use of intermediaries, the regression analysis suggested that spatial relations development involving visible detour problems are related to the use of intermediaries. However, Uzgiris (1973) suggested that object permanence may be influencing the development of both of these relationships at this particular stage.

In summary, the investigation was designed to compare the means-end performance of developmentally delayed and nondelayed children and to evaluate both the sequential nature of the means-end items and interrelationships with other areas of sensorimotor development. The results obtained indicated that delayed and nondelayed children did not exhibit different developmental patterns with respect to means-end behavior. In addition, the scalogram analysis confirmed the assumption that the scale represents an ordinal sequence. Additional research should include the development of a downward extension of the means-end scale as well as exploring the possibilities of using the assessment procedure to help build and evaluate effective training sequences.

Determination of Interrelationships Within a Limited Behavioral Repertoire

R. Brinker and W. Bricker

This investigation was focused on a set of repetitive self-stimulating forms of behavior emitted by a young developmentally delayed child. The child, MS was 26 months old at the time of the study. When tested at 17 months of age the child's MA was 7.6 months. A large portion of MS's time both in the classroom and at home was spent flipping plastic figures attached by a vertical rod to a playpen. A small spring was located under each of the playpen figures which allowed either upward or downward deflections of the figures thus causing them to bounce. When flipping the playpen figures MS frequently ground his teeth and sometimes emitted monosyllabic vowel sounds. The relationship among these three forms of behavior were investigated by manipulating the physical and social context in which such behavior occurred. The investigators postulated that if the effects of flipping (i.e. the bouncing of the playpen figures and the concommitant noise) were eliminated then the amount of flipping would decrease. A second hypothesis was that the number of vocaliaations would vary as a function of the presence or absence of another person. To test these hypotheses, video tapes of MS's behavior were made when:
1) the playpen figures were in the normal state (baseline) and
2) the playpen figures were taped down so that flipping them did not produce the characteristic bounce and noise. The child's behavior was observed under the above two conditions both when a person was present in the experimental room and when MS was alone in the experimental room. Two independent observers recorded the number of

flips, vocalizations, and teeth grinds from the videotapes. One flip was counted each time MJ touched and released a crib figure. The frequencies of vocalizations and teeth grinds were also counted. The three forms of behavior were observed in two sessions of 24 minutes each, i.e. 12 minutes with the crib figures taped down and 12 minutes with the crib figures free. Another person was present in the experimental room half of the time during which the figures were taped down and half of the time during which the figures were free. The order of exposure to experimental conditions was counterbalanced within and across sessions.

Three separate three-factor (2x2x2) within groups analyses of variance were performed on the 48 one-minute observations for each of the dependent variables. The effects of the experimental conditions on vocalizations are represented in Figure 5. The analysis of variance indicated that more vocalizations occurred when figures were taped down than when they were free (_df_=1,40; _F_=49.07; _p_<.001); more vocalizations occurred when another person was present in the experimental room (_df_=1,40; _F_=9.4; _p_<.005); and more vocalizations occurred in session one than in session two. However, there was an interaction between condition of the playpen figures and sessions (_df_=1, 40; _F_=6.29; _p_<.05) when vocalizations emitted was the dependent variable. A Neuman-Keuls test (Winer, 1962, p. 196) revealed that the source of this interaction was due to the emission of a greater number of vocalizations during the first session when the figures were taped down. The significant interaction is suggestive of an extinction effect for vocalizations as MJ was exposed to free or taped playpen figures across time. The effects of the experimental

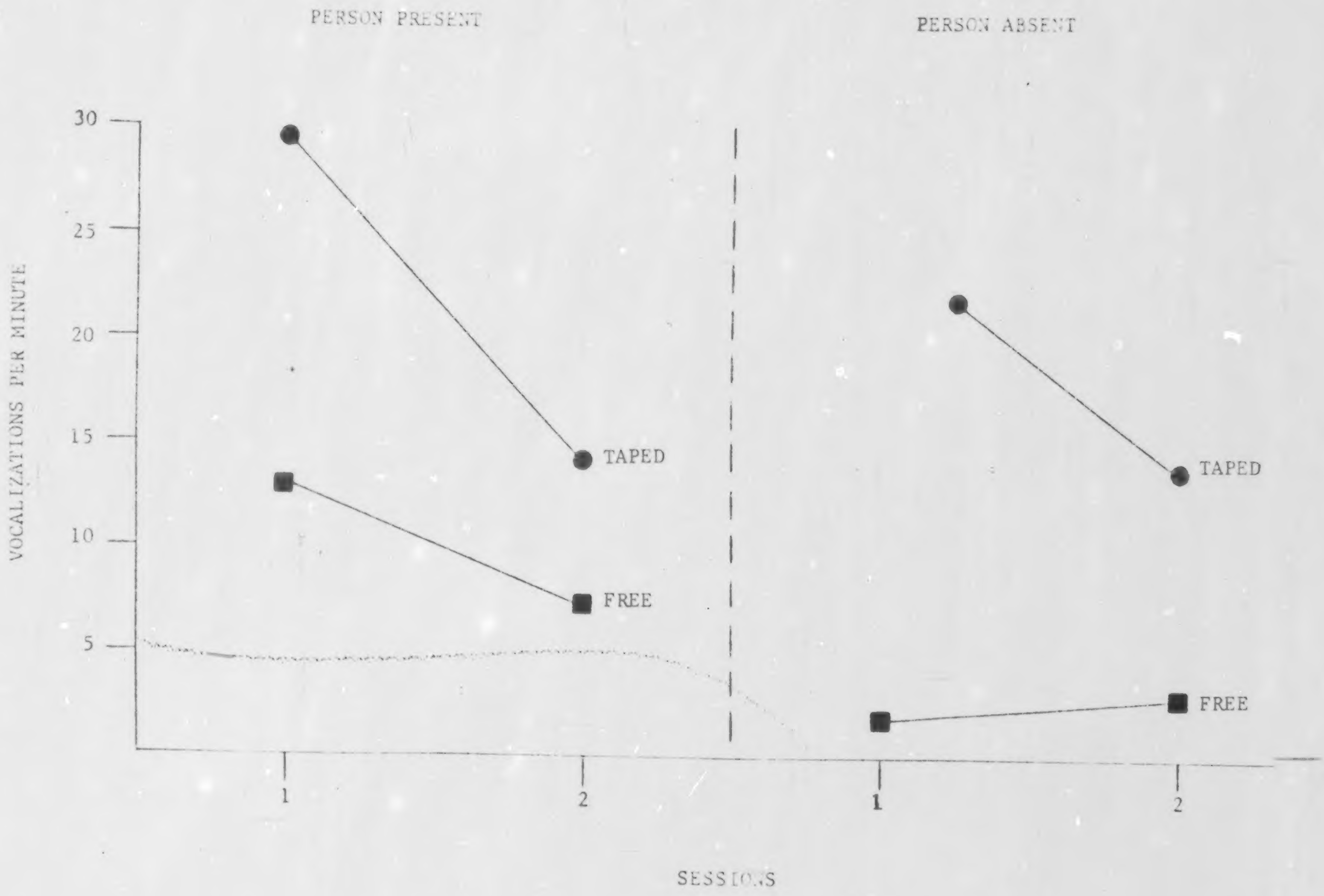

Figure 5. Effects of experimental conditions on vocalization.

treatments for flipping behavior are presented in Figure 6. More flips occurred when the figures were free than when they were taped down (df=1, 40; F=29.9; $p<.001$). Furthermore the differential amount of flipping under free versus taped conditions increased across sessions (df=1, 40; F=4.8; $p<.05$). Finally, analysis of the effects of experimental conditions on teeth grinding revealed that a greater amount of teeth grinding occured when figures were free than when they were taped down (See Figure 7). Taken together the results reveal that teeth grinding and flipping are inversely related to vocalization, and that these repetitive self-stimulating forms of behavior occurred more frequently in an environmental context conducive to their maintenance. Thus if there is a scheme called flipping, then the scheme is directed toward an object only when certain consequences are produced.

A second experiment was conducted to determine whether vocal responses by an adult which were made contingent upon MS's vocalizations would increase the number of vocalizations MS emitted. The design of the second study was similar to the first with the exception that an adult was present in the experimental room throughout the second study. During half of the experimental session, which consisted of eight 3 minute segments, the experimenter responded to each child's vocalization with a variety of vocalizations (e.g., hi, ooo). During the other half of the session the experimenter looked at the child and remained silent. The condition of the playpen figures was manipulated in the same manner as in the first experiment. During half of the experimental session the playpen figures were free and during the other half they were taped down. Two sessions of 24 minutes each were videotaped, and vocalizations, flips, and teeth grinds were independently recorded by two observers.

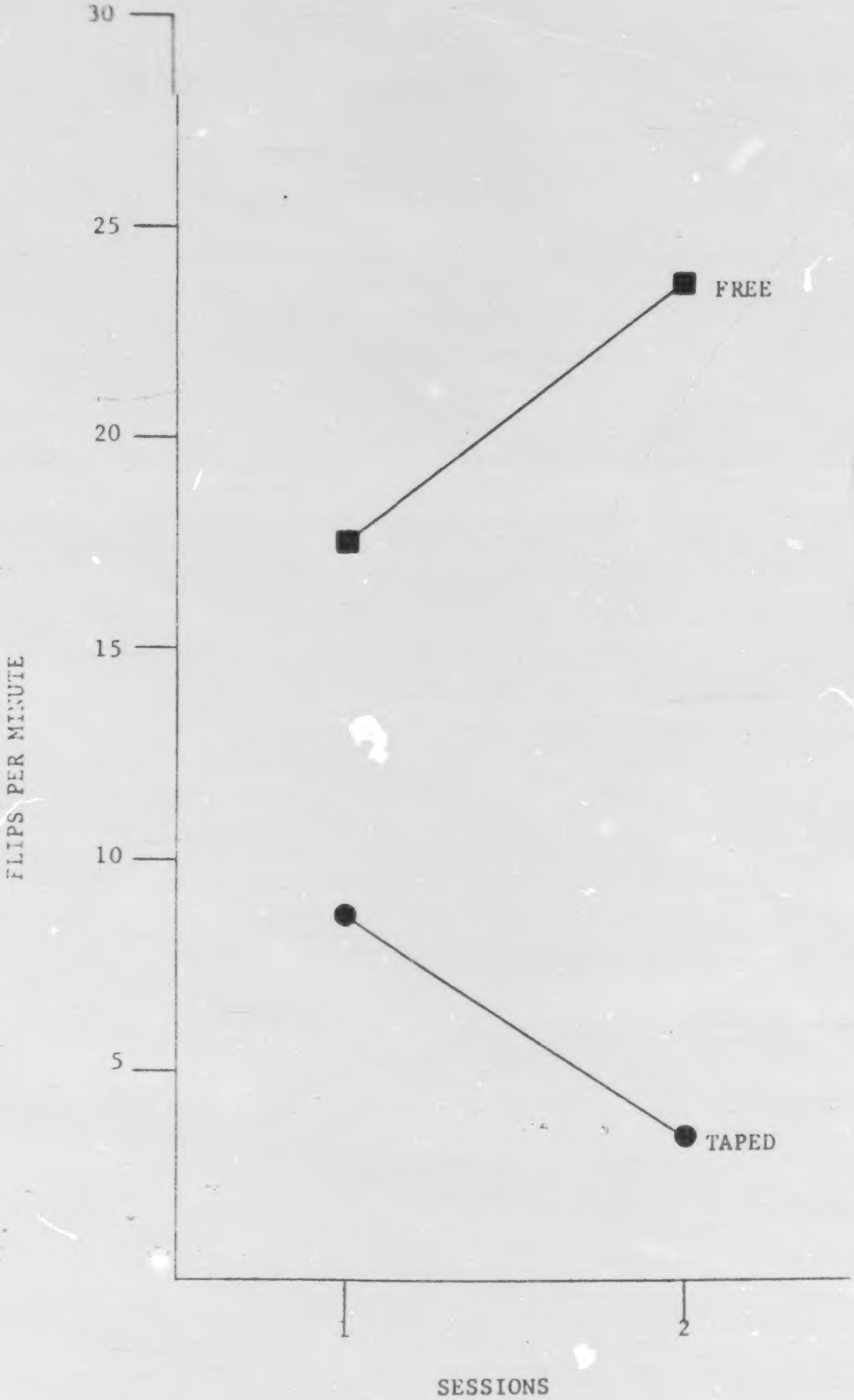

Figure 6. Number of flips per minute under conditions of free and taped.

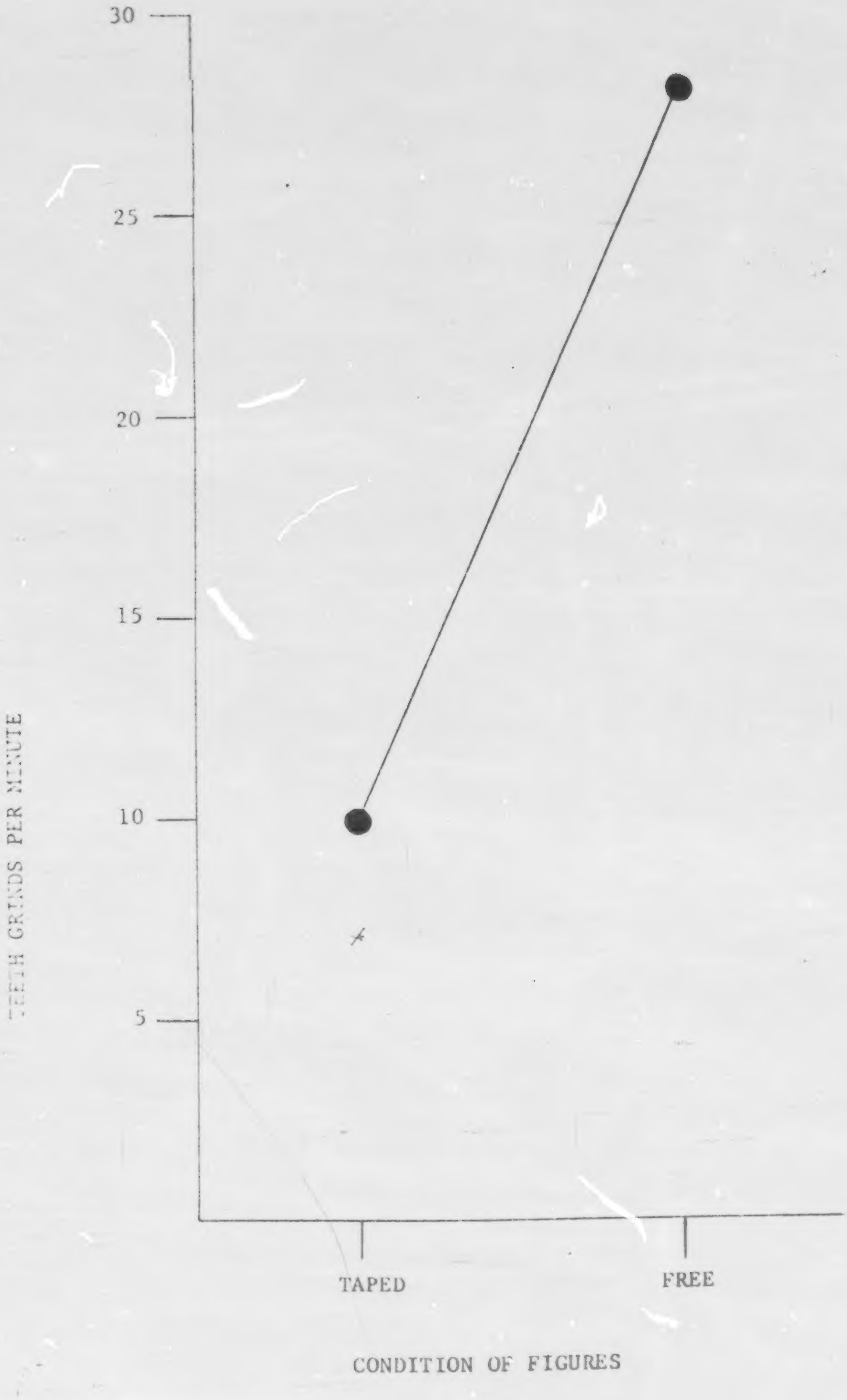

Figure 7. Number of teeth grinds per minute under conditions of taped and free.

Three separate three-way (2x2x2) within group analyses of variance were performed on the 48 one minute observations for each of the dependent variables. As in the previous study, the analyses revealed that more flipping occured when the playpen figures were free than when they were taped down ($df=1,40$; $F=64.9$; $p<.001$). Teeth grinding occurred fewer times when the experimenter responded to the child's vocalizations than when he did not ($df=1, 40$; $F=18.5$; $p<.001$). More vocalizations occurred when the experimenter responded to vocalizations than when the experimenter emitted no vocal consequences ($df=1, 40$; $F=29.0$; $p<.001$). In addition, fewer vocalizations ($p<.05$) occurred in session two than in session one ($df=1, 40$; $F=4.4$; $p<.05$). No significant interactions were obtained in this investigation.

The two studies considered together indicated that MS's predominant behavioral repertoire, consisting of teeth grinding, flipping, and vocalization, comprises a structure which can be shown to vary systematically as a function of environmental manipulations. Teeth grinding and flipping tend to occur together and seem to be inversely related to vocalization. When the consequences of vocalization and flipping are manipulated the frequency of occurrence of these forms of behavior change dramatically. These findings suggest that flipping may be an action that allows MS to discriminate certain characteristics of the environmental objects about him. If this hypothesis is tenable then flipping should vary as a function of objects. A subsequent study provided some data to support this hypothesis.'

Sensorimotor Assessment Performance as a Function of Task Materials

J. Filler

According to Piaget (1952) the emergence of complex forms of behavior is dependent upon a precursory repertoire of simpler forms of behavior which expand and coordinate to form more complex structures. For example a child must be able to track objects before he will search for them when they disappear from view. Disappointed with the ability of traditional assessment devices to locate the position of children in developmental space with respect to essential prerequisite skills, a number of investigators including our group have developed assessment instruments from the Piagetian perspective (e.g. Escalona & Corman, 1969; Uzgiris & Hunt, 1966). Recently, we have become more convinced that careful attention should be given to the nature of the objects which are employed in presenting the items of such assessments. That is, for the items of any scale the probability of an appropriate action on the part of the child is to some degree a function of the stimulus properties of the object which is used. As pointed out by Ray and Sidman (1970) it is important to carefully map the topographies of response, but it is equally important (and much more difficult) to map the properties of stimuli which, at a particular point in time, control response form.

As a first step in the effort to investigate the tenability of the hypothesis that performance on the project's Sensorimotor Assessment varies as a function of the stimulus objects employed, one child selected from the infant group was examined on each of the four subscales across four assessments. The child, MS, who also participated in the previous study, was used in this investigation. From the assessments it was apparent that MS had exhibited only the most rudimentary forms of object permanence, means-end, physical causality, and spatial relations; however, classroom observations of the child presented a different picture from that indicated by the assessments. For example, MS could search persistently for hidden objects and would in daily activity approach and attain objects with an apparent sense of direction and purpose. However, it was also apparent that this child was selective in choosing those objects with which he interacted. Even more apparent was the consistent repetitive form of behavior he engaged in with the objects i.e. "flipping." Examining data from the previous study done with MS it was concluded that this was a high rate behavior and that it seemed to vary as a function of object characteristics such as the sound produced and the size and number of object parts that could be flipped.

In this study, an attempt was made to determine objectively if MS could discriminate objects (toys) using rate per minute of flipping and time spent in interaction as dependent variables when access to the objects was controlled. Six objects (Queen Bee, Spin Rattle, a red block 2" x 2", a tin cup, squeak pig, squeak cow) were presented in pairs a number of times such that each object was paired with every other object once. MS sat on the floor and each pair was placed in front of him for a period of three minutes. During this time two observers recorded flips and time on each object. These data revealed that MS exhibited quite distinct preferences favoring Queen Bee above all other objects with the two squeak toys being least preferred. Perfect rank order correlations (1.00) were obtained for the relative preference positions of each of the objects across the three measures; rate per minute, precentage of time, and total responses.

On the basis of these results the next phase of the study involved the use of these objects in a predetermined fashion as the objects to be presented during a reassessment of the Sensorimotor Assessment. Although two assessments, one which used the three preferred items and one which used the three non-preferred items would have provided more information, due to time only one assessment was conducted which utilized the three preferred objects (Queen Bee, Cup, and Rattle). It was expected that overall, MS's scores in each sensorimotor area would improve as a function of employing the above items.

Figure 8 presents the previous administrations of the Sensorimotor Assessment as well as the administration which employed the preferred objects for each of three subscales, (object permanence, means-end and spatial relations). In general, the use of preferred objects resulted in an increase in the number of appropriate responses emitted. One subscale, visual tracking, was not analyzed because of ceiling effects. Although interpretations of these results are tentative in that an additional administration of the assessment using non-preferred objects was not conducted, these findings would indicate the importance of careful evaluation of item content (objects used) in interpreting performance on assessment instruments.

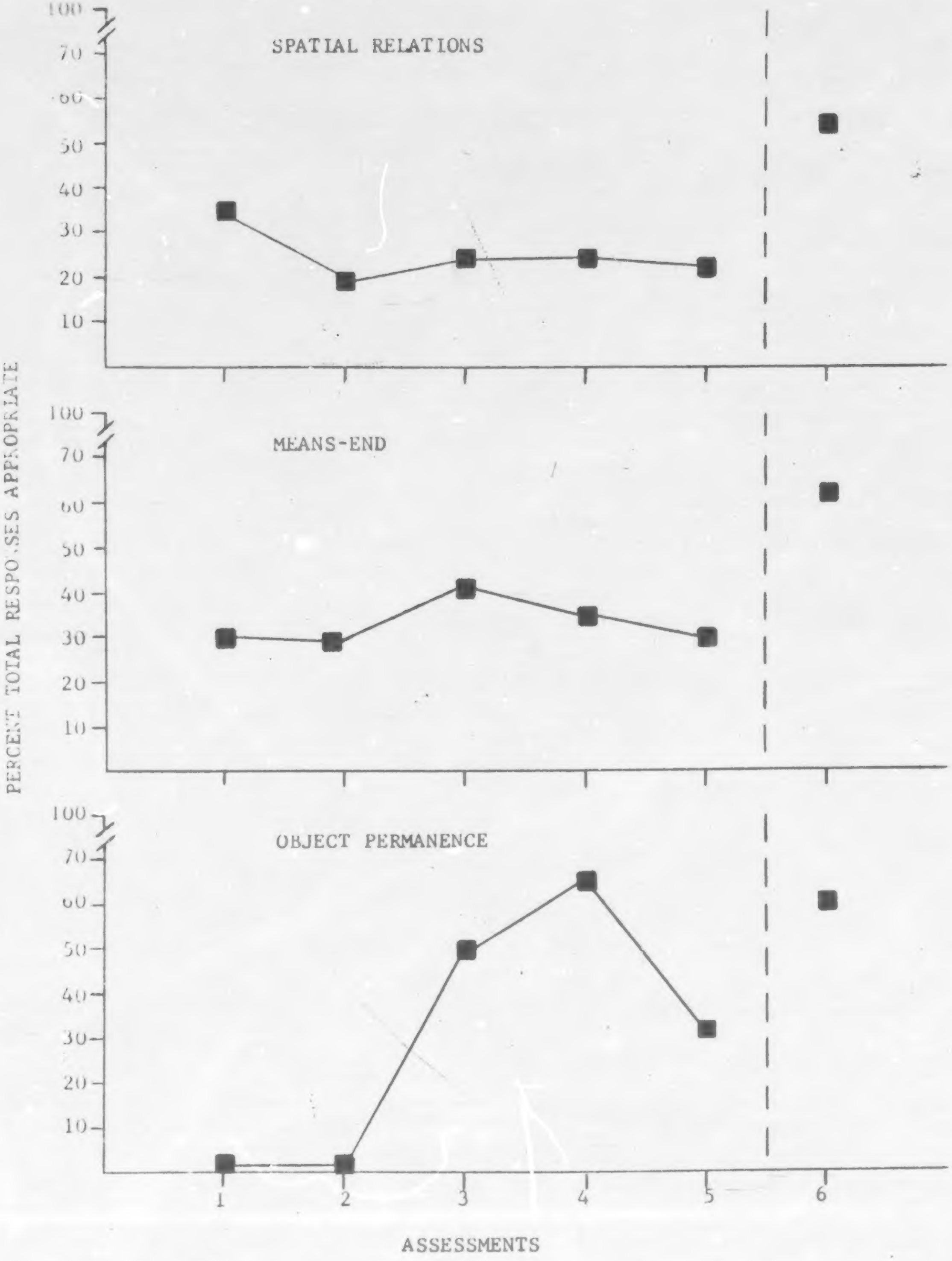

Figure 8. Mean total appropriate responses on the Object Permanence, Means-End and Sp tial Relations scales across assessments.

Note: Assessment 6, separated by the broken line, employed the preferred objects.

Parental Teaching Style Research

The parent teaching style research conducted during the past year represents the initial phase of a three-year project designed to provide information concerning techniques of teaching parents to work effectively with their developmentally delayed children. More specifically, the questions of major concern are: 1) What forms of trainer behavior can be demonstrated to be functionally related to efficient child performance in learning tasks? 2) What methods can be employed to train parents who do not exhibit these instructional techniques to utilize them both in a structural laboratory setting and in other settings such as the home? and 3) How effectively can trained parents instruct other parents in use of such techniques? The research conducted during the past year was addressed primarily to the first area of investigation mentioned above.

Each of the studies described below involved the use of a scale devised by the present investigators to provide concomitant indices of both parent and child behavior. This scale, which has been described by Robinson and Filler (1972), consists of seven categories of mother behavior emitted prior to child response, three categories of child response and three categories of mother behavior which occur consequent to child response. The ten categories of mother behavior were derived from an experimental analysis of behavior framework. In all of the studies, training sessions were videotaped and scale ratings were obtained only from the videotape records. The training task that was employed was a match-to-sample task (adapted from the Leiter International Performance Scale, 1969) which consisted of four blocks each of which had a different picture printed on one side. These were to be matched with four pictures which were printed side-by-side on a single card mounted on a slot-board. This task was selected because the response required of the child was easily definable and because the task could be varied in difficulty according to the matching materials presented while maintaining the same form of child response.

Evaluation of Teaching Style: A Comparison of Teachers and Mothers

R. Smith, J. Filler, W. Bricker, C. Robinson, & L. Vincent-Smith

The first investigation was designed to contrast the instructional techniques employed by a group of four teachers trained in behavior modification with those of a group of relatively untrained mothers working with both delayed and nondelayed toddler-age children. Each trainer was asked to teach the two children assigned to her the match-to-sample task described earlier for three periods of 12 minutes each for a total of six training periods. Both the teachers and mothers were individually told prior to the first training session that they could use any instructional methods they thought would be effective in getting their child to engage in the task in a correct manner. No specific directions were given to the trainers concerning possible teaching methods. At the beginning and end of each training session, a probe was administered by the trainer to provide an index as to whether the child had mastered the task.

Two raters independently viewed approximately 70 percent of the training sessions to provide interrater reliability on each of the categories of mother and child behavior. The obtained mean reliability for the scale categories was .88 with a range of .67 to .99. Separate three-way analyses of variance with scale categories providing the dependent measures were performed with trainer groups (teachers and mothers) as the between factor and child groups (delayed and nondelayed) and training sessions as within factors. The results of the analyses of trainer antecedent categories of behavior indicated that placement of the block by the trainer so as to provide a cue for correct matching occurred significantly more often for the delayed children than for the nondelayed children and that cue placements were employed more frequently by teachers than by mothers. Although no difference was found in the use of physical guidance or prompting by teachers and mothers, the frequency of physical guidance was greater on the first session than on the third session. A similar trend was found for the use of limiting placement choices and thus increasing the probability of a correct child response. The only significant difference detected in the categories of trainer consequent behavior was in the use of tangibles which resulted from the greater use of edibles for correct child responding by teachers. The analyses of verbal and physical feedback categories yielded no significant differences. Additionally, no significant differences were obtained for the categories of child correct responding.

A second study was conducted with a different group of teachers trained in behavior modification teaching only delayed children both a receptive vocabulary and expressive vocabulary task (for a description of the tasks see D. Bricker & W. Bricker, 1972). The primary objective of this study was to evaluate the generalizability of the assessment scale when applied to tasks requiring different forms of trainer and child behavior. Mean interrater reliability for the scale categories was .91 with a range of .73

to .93. Although the individual scale reliabilities were adequate, several trainer antecedent categories were not comparable because of differences in task requirements across the two instructional settings. On those scale-categories that were comparable, trainer behavior was found to vary as a function of task only for the feedback categories.

The results of these studies, particularly the findings of the study contrasting teachers and mothers, formed the basis for the following investigation which involved manipulations of several categories of trainer behav[illegible]ecifically, the interventions selected were derived in part from the differences in antecedent and consequent trainer behaviors observed between teachers and mothers.

Modification of Maternal Teaching Style: The Effects of Task Arrangement on the Match-to-Sample Performance of Delayed Children

J. Filler, W. Bricker, & R. Smith

In the third and final study of parent teaching style completed this year, 21 developmentally delayed preschool-age children and their mothers served as subjects. Each mother was instructed to teach her child an iconic match-to-sample task similar to those described previously. The specific task which a given mother was assigned to teach was selected from a pool of six and was one on which initial child performance was at chance level (Pretest). Following determination of the training task each mother was asked to work with her child for six periods of approximately six minutes each. After three sessions (Baseline) each child received a repetition of the Pretest with the exception that only the training task and two of the remaining nontrained tasks were presented (Probe 1). Each of the 21 mother-child dyads was then assigned to one of three groups. The groups were matched in terms of child's MA, CA, and IQ as well as family income, mother's age, and mother's years of formal education. All mothers were requested to report for each of the three remaining sessions (intervention) 15 minutes earlier than they had for the first three sessions. During this time they individually viewed videotapes of themselves working with their children. However, the nature of the interaction between the experimenter and the mother during these 15 minutes differed as a function of group assignment.

For the seven mothers assigned to the first condition (Group M) the experimenter focused all of his comments upon the mother's arrangement of the materials in a manner which maximized the probability of a correct match. Since the results of previous studies had indicated that trainer antecedent manipulations of the materials was one dimension on which teachers and mothers differed, it was expected that training mothers to increase the incidence of cue placements and limiting choices available for placement would exert a positive effect upon child performance. The experimenter focused all of his comments on instances of the mother providing positive verbal, physical, and tangible feedback (edible or toy) to each correct child response for the seven mothers assigned to the second group (F). The seven mothers assigned to the third group (C) viewed tapes in a manner exactly the same as that employed with mothers in groups M and F with the exception that the experimenter did not comment on any specific aspect of the mother's teaching style. Following completion of the last session in intervention, each child received a repetition of Probe 1 (Probe 2). Two raters independently rated 63 of the 126 taped sessions. The mean interrater reliability for the 10 categories of mother behavior and three of child behavior was .99.

Correlational analyses of data collected during the Baseline phase indicated that two forms of mother behavior accounted for the majority of variance associated with child performance. Utilizing a step-wise multiple regression technique positive physical feedback was found to account for 43 percent of the variance associated with correct responding. Cue placements of the blocks accounted for an additional 13 percent of the variance. Additional regression analyses which employed cue and positive physical feedback as criteria and mother demographic variables as predictors failed to reveal any significant relations. Also child demographic variables, including sex and etiology, failed to predict the incidence of cue placements and limiting choices. However, the degree to which mothers utilized stimulus specific verbal referents in their instructions during training was inversely related to the difficulty of the task as determined by an analysis of the Pretest performances across each of the six tasks ($r = -.77$). Utilizing child percentage correct on the trained task during Probe 1 as the criterion and mother behavior during training as predictors no significant relations could be determined.

In order to determine whether or not significant changes had occurred in the various forms of mother behavior across sessions as a function of the different intervention conditions, analyses of variance were performed, one for each of the forms of mother behavior rated. The design employed permitted an assessment of the between subjects effect of Groups, the within subjects Sessions effect and the Groups by Sessions interaction. Each of three analyses which employed ratio of positive verbal feedback, positive physical feedback and tangible feedback to correct child response revealed significant Groups by Sessions interactions. In each analysis the source of the interaction was traced to the fact that Group F obtained significantly higher ratios for Intervention sessions than for Baseline sessions while Groups C and M did not change across sessions. Similarly when the incidence of cue placements and limiting choices were dependent variables significant Groups by Sessions interactions were obtained which were found to result from significant Sessions effects for Group M but not for Groups C or F. In only one other analysis of mother behavior was a significant effect obtained. For all groups the frequency of maternal efforts to focus the child's attention by pointing decreased across sessions. When percentage correct child performance was the dependent variable a significant Groups by Sessions interaction was also obtained indicating that the children of mothers assigned to Group M obtained higher performance scores during Intervention than during Baseline while the performance of children of mothers assigned to the other two groups did not improve. Similar analyses of child performance across Pretest, Probe 1, and Probe 2 indicated that, although a significant trials effect was obtained, the groups did not improve at differential rates. However, sign tests revealed that a significant number of children in Group M showed a gain over pretest score from Probe 1 to Probe 2.

In summary, the studies completed during the current year have indicated that teaching styles of trained behavior modifiers differ from mothers of delayed children mainly in terms of the manner in which they arrange the materials of task prior to requesting a child response. In addition, by manipulating the teaching styles of mothers, it has been determined that these antecedent forms of trainer behavior are critical to the performances of delayed children on a laboratory learning task. While the natural teaching styles of mothers have been found to vary somewhat as a function of child characteristics, like those data presented by Kogan and Tyler (1973), the differences do not seem to be as pervasive as some earlier parent-child interaction studies had suggested. Taken together our findings suggest that efforts to train parents should place a heavy emphasis upon the systematic arrangement of materials as a critical content area.

Language Research

This section of the report contains summary descriptions of the language research which has been completed in the project during the third year. The primary thrust of this research has been to study the parameters of language as they specifically relate to the development of more effective training programs for developmentally delayed children. A major portion of time has been spent on modifying and implementing the classroom language training program. We have also been interested in attempting to establish more definitive information on initial receptive processes particularly in reference to prerequisite behavior and the use of indirect information for acquiring labels. A major portion of time has also been spent on assessing the verbal imitation and syntactic repertoires of the children enrolled in the project.

Acquisition of Receptive Vocabulary by Preschool-age Developmentally Delayed Children

L. Vincent-Smith, D. Bricker & W. Bricker

The purpose of the present investigation was to examine some parameters of receptive vocabulary learning in delayed children using a two-choice discrimination paradigm. This study was a replication of the procedure employed by Vincent-Smith, D. Bricker and W. Bricker (in press) in examining the acquisition of receptive vocabulary in young, nondelayed toddlers.

The three dimensional stimulus objects used in this investigation were classified as either known or unknown. Known items were objects that all subjects selected correctly 80 percent of the time on a two-choice discrimination task (D. Bricker, Vincent-Smith & W. Bricker, 1973). Unknown stimuli were objects such as a megaphone and wrench that young children would probably not have yet learned the labels. On half of the two-choice trials an unknown and known object were paired, while on the other half two unknown objects appeared together. On trials where a known object was presented as the distractor performance was expected to be above chance from the initial session. On trials where two unknown objects were presented, performance was expected to be at chance initially. Further it was hypothesized that performance on these problems would improve across trials to above chance.

Subjects for the present investigation were 10 developmentally delayed children between 25 and 48 months of age. All subjects had IQ scores of 70 or below on the Stanford-Binet, Form LM.

Using MA as a determiner subjects were divided into two groups. The low MA group composed of five children had MA's between 25 and 35 months with a mean MA of 31 months. The high MA group composed of the remaining five children had MA's between 37 and 48 months with a mean MA of 41 months.

A Wisconsin General Test Apparatus was used to present the receptive vocabulary problems to the subject. The stimuli were 40, small, three dimensional objects mounted on 10 x 10 cm. gray wooden plaques. Ten of the objects were classified as known while the remaining 30 objects were classified as unknown and randomly assigned to one of three groups. The study was conducted in two phases: 1) Testing, and 2) Learning Assessment. For a complete description of the procedure employed see (Vincent-Smith, D. Bricker & W. Bricker, in press).

Testing

The assessment instrument employed during this phase involved 100 two-choice discrimination trials. On half of these trials an unknown object served as both the SD and S^{Δ} (unknown problems), while on the other half an unknown object was the SD and a known object was the S^{Δ} (known problems). Ten trials of each type were administered per day.

Learning Assessment

This phase of the investigation was conducted in order to determine whether subjects had learned the names of the unknown objects when presented with a known distractor as in the known problems. This phase consisted of 30 two-choice discrimination trials. The unknown SDs from the previous known problems served as SDs for this assessment, while the unknown SDs from the previous unknown problems served as the S^{Δ}s. Ten trials were administered per day.

Results

An analysis of the results of the Phase I assessment data was preformed on the basis of number correct for the 50 unknown and 50 known problems across the five sessions, 10 problems of each type per session. The mean number correct for the low MA subjects for unknown problems was 6.4, 6.4, 6.8, 6.8 and 7.2 for sessions, 1, 2, 3, 4, and 5 respectively. The corresponding means for the known problems were 8.8, 8.0, 7.6, 7.8 and 8.2. For the high MA subjects the mean number correct for the unknown problems was 5.6, 5.8, 6.4, 6.6 and 6.8 for sessions 1, 2, 3, 4 and 5 respectively. The corresponding means for the known problems were 9.4, 9.6, 9.0, 9.8 and 8.8.

A Lindquist Type VI analysis of variance was performed on these data with low versus high MA as the between variable and sessions and unknown versus known problems as the within variables. While the main effect for MA level and sessions were nonsignificant, the main effect for type of problem was significant (F=36.58, df 1/8, $p<.0001$). The MA level by sessions interaction and the MA level by sessions by problem interaction were also nonsignificant. The MA level by type of problem interaction was significant (F=4.58, df 1/8, $p<.05$) as was the sessions by problem interaction (F=6.69, df 4/32, $p<.001$).

Treatment by subjects analysis of variance were performed on the data for known and unknown problems separately in order to determine the source of the interaction. While no significant main effect for sessions was indicated for known problems, the main effect of sessions was significant for the unknown problems ($F=3.22$, df 4/36, $p<.05$). The means for sessions 1 through 5 for the unknown problems were 6.0, 6.1, 7.8, 6.7 and 7.0 respectively. The corresponding means for the known problems were 9.1, 8.8, 8.3, 8.5, and 8.5. These data are presented in Figure 9. A Newman Keuls test of simple effects indicated that for the unknown problems session 3 was significantly different from session 1 and 2 with no other significant differences obtained.

Neither Newman Keuls nor the Lindquist test of simple effects detected the source of the MA level by type of problem interaction. The mean number correct for the high MA subjects was 6.6 for the unknown problems and 9.3 for the known problems. The corresponding means for the low MA subjects were 6.8 and 8.1. These data are presented in Figure 10.

The final area of analysis involved data from the Phase II Learning Assessment. The mean number correct out of a possible 10 trials for each session for the low MA subjects was 7.8, 8.2 and 7.8. The corresponding means for the high MA subjects were 8.8, 9.0 and 9.2. A Lindquist Type I analysis of variance performed on these data with MA groups as the between factor and sessions the within factor yielded no significant effects. Collapsed across groups and sessions the mean number correct out of 10 possible was 8.2 which was significantly different from chance performance which was five.

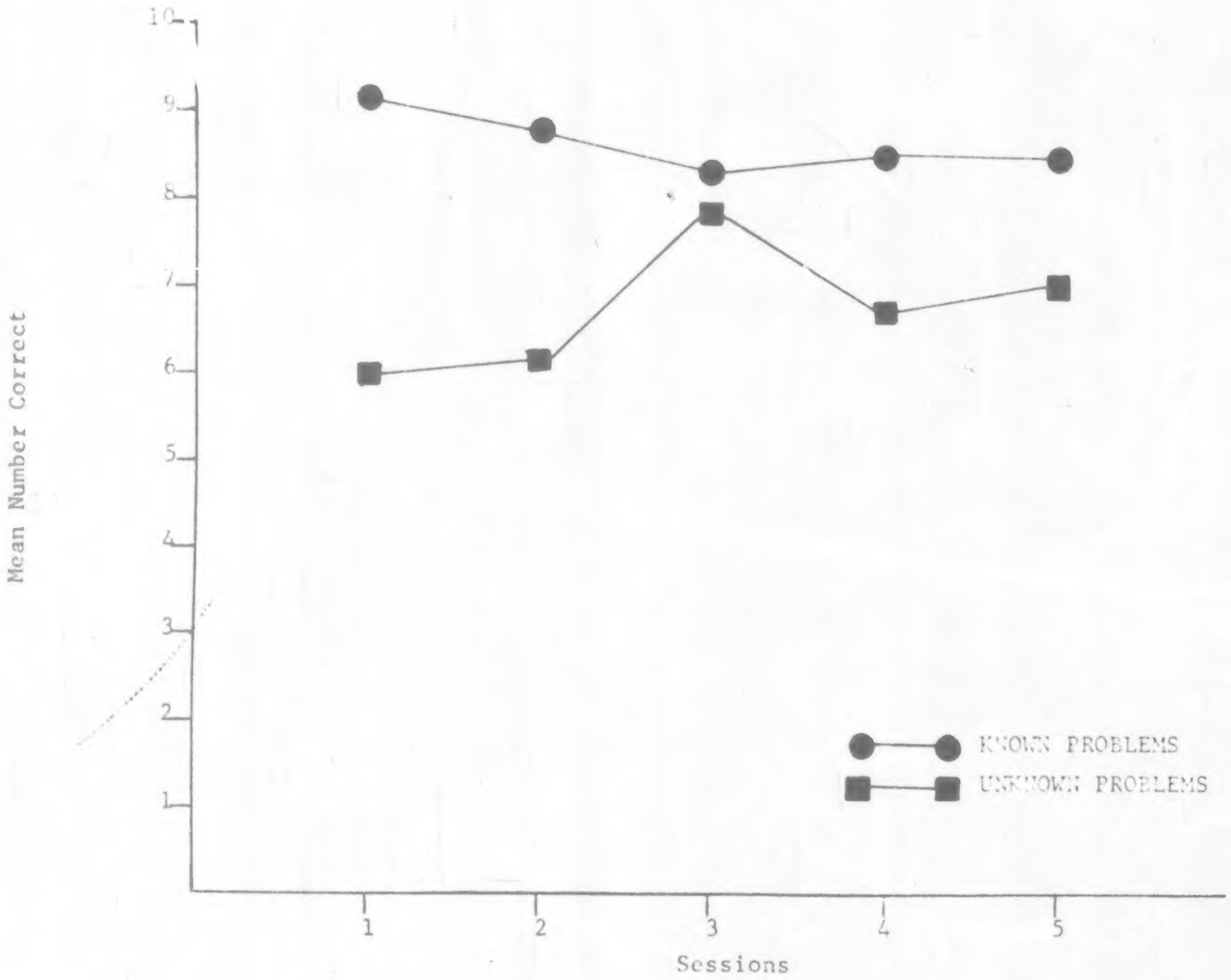

Figure 9. Mean number correct across session, for known and unknown problems.

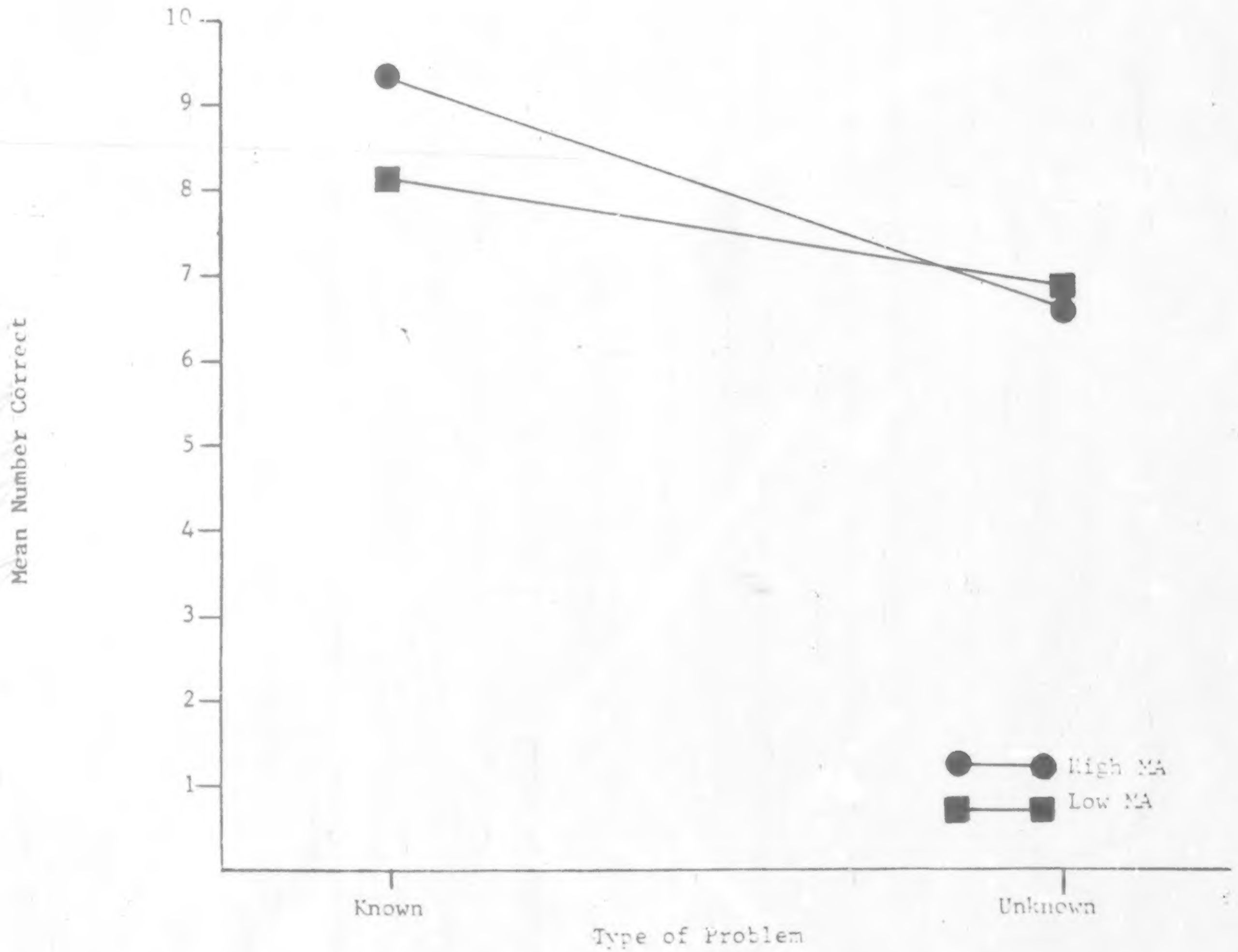

Figure 10. Mean number correct on unknown and known problems, for high and low MA subjects.

The results of this investigation closely parallel the results obtained by the Vincent-Smith, D. Bricker and W. Bricker (in press) investigation with young, nondelayed children. The mean CA difference between the delayed and nondelayed groups was 12 months. Like the nondelayed children in the Vincent-Smith et. al. study the delayed children in this investigation learned the names of the unknown object across sessions when paired with a known distractor. In addition, the children were able to employ the cue of a known distractor and from the first trial demonstrate above chance performance on the known problems.

An Evaluation of a New Assessment Procedure: Functional Use of Objects, Receptive Vocabulary and Expressive Vocabulary

L. Vincent-Smith and G. Chatelanat

The purpose of the present investigation was to evaluate an assessment procedure which examined the child's performance in three skill areas simultaneously: functional use of objects, receptive vocabulary, and expressive vocabulary. Vincent-Smith and D. Bricker (1972) have reported that in comparing delayed children's performance for receptive understanding and labeling of common environmental objects, the children sometimes performed better on the expressive than receptive task. This is in conflict with most developmental data which indicate that receptive language precedes expressive language. In the Vincent-Smith and Bricker (1972) study receptive vocabulary was evaluated using a standard two-choice discrimination procedure. Properties of the objects themselves, rather than the auditory cue provided by the experimenter, seemed to control the child's behavior. For example, the child might pick "ball" each time it appeared as the object to be chosen but also each time it appeared as the distractor. Analyses of patterns of responding to individual receptive items (See D. Bricker, Vincent-Smith & W. Bricker, 1973 for a detailed explanation of pattern anaylses) indicated that items which were "known" expressively, but not receptively, often fell in the categories of preference or avoidance objects. In addition, the same general result was found for items which were indicated as "known" in neither domain. That is, the auditory cue did not determine choice behavior. Rather this seemed to be determined by properties of the objects themselves.

The children's lack of appropriate responses to the auditory cue could indicate that behavior prerequisite to receptive vocabulary needed to be investigated and trained before initiating receptive vocabulary training. Piaget and Inhelder (1969) and Bruner (1966) have suggested that before a child learns to respond to object labels he must be able to manipulate the object in a functionally appropriate fashion.

W. Bricker & D. Bricker (in press) have reported data which indicate that although a child might not perform appropriately in the receptive or expressive task, he would often be able to demonstrate the appropriate use of an object. For example, a child might pretend to drink from a cup when he did not label cup or choose it appropriately in the two-choice situation.

The present investigation was conducted in order to explore this relationship between functional use of objects and receptive vocabulary performance. In addition, a new procedure was evaluated which allowed the children to handle and manipulate the objects. This procedure was implemented in the hope that the problems associated with the standard two-choice procedure might be overcome.

The new procedure which assessed functional use of objects, receptive vocabulary and expressively vocabulary simultaneously was given to 24 delayed and 23 nondelayed children. The items were chosen on the basis of a difficulty analysis performed on the data presented by Vincent-Smith and Bricker (1972) and W. Bricker and D. Bricker (in press). From 40 possible items 11 were chosen to be tested functionally and 12 receptively and expressively. Six items were contained on all three lists.

The stimulus objects to be tested were divided into 11 sets and each set was presented separately. Each set was composed of one test-object (the one for which functional use was assessed) and four choice objects. For example, one test object was baby and the choice objects presented with it were cradle with blanket, baby bottle, pan and block. Objects to be assessed receptively and expressively could be either test or choice objects.

The subject was brought into the experimental room and seated with an experimenter in front of the closed door of a WGTA. A second experimenter was seated behind the WGTA and arranged the choice objects on the floor of the box. The child was given the test object and encouraged to play with it. The door of the WGTA was then opened. If the test-object was to be assessed expressively the child was asked "What is this?" as the experimenter pointed to the test object. The child's response was scored as appropriate, inappropriate or no response. If the object was not to be assessed expressively the experimenter asked the child "What can you do with this?" If the child did not interact with the choice objects, the experimenter pointed to them and asked the child "Is there anything you can use with that (the test object)?"

For each set of choice objects, at least two but not more than three were appropriate for use with test object. At no time during the assessment of an object set did the experimenter label the objects. The child's response to the test-object was recorded on a pre-established score sheet. All activities performed by the child with the test object by itself or in relation to the choice objects were recorded.

Responses were scored as either symbolic adequate, symbolic inadequate, or sensorimotor. Responses were considered symbolic adequate when the child demonstrated the appropriate function of the object presented even if the particular action might be considered socially inappropriate. For example, if the child attempted to cut his shirt with the scissors this would be considered symbolic adequate. Responses were considered symbolic inadequate when the child in his interaction with the test object demonstrated an inappropriate function for an object. For example, if the child placed the cup in the bed and rocked it, the response was scored symbolic inadequate. Responses were considered sensorimotor when the child's interaction with the object did not involve any functional use but only a motor pattern which was repeated several times. For example, if the child waved the baby doll by its feet in the air repeatedly.

After the child had interacted with the test and choice objects, the test object was placed on the floor of the box and the child was asked to point to at least one of the objects. The child's response was scored as correct or incorrect. In addition for five of the objects set he was then asked to label one of the test objects. Completion of the assessment generally required three 15-minute sessions. Three or four object sets were presented per session.

For the purpose of data analysis the subjects were divided into four groups based on the classroom component they attended. Sixteen of the delayed children attended the preschool while the other eight in the toddler classroom. Ten of the nondelayed children attended the preschool with the other 13 in the toddler classroom.

For the six items which were tested in all three domains the nondelayed children in the preschool demonstrated the appropriate function, receptive vocabulary and expressive vocabulary on 5.8 of the items. This obviously is indicative of a ceiling effect with items not sufficiently difficult to differentiate children or domains. A similar although not as dramatic effect was obtained for the delayed preschool children. They demonstrated appropriate functional use on 4.9 of the items, receptive vocabulary on 5.3 and expressive vocabulary on 4.3.

A ceiling effect was not apparent in the data of the younger toddler-age children. The nondelayed children demonstrated appropriate responses on functional use, receptive vocabulary and expressive vocabulary of 4.2, 4.2 and 2.6 respectively. Corresponding means for the delayed children were 3.3 on functional, 2.2 on receptive and .8 on expressive. The mean number correct for the receptive vocabulary section of the assessment may be inflated. The scores for receptive vocabulary include a chance factor. That is, by chance alone the child could correctly choose 1.5 objects out of six.

On the overall assessment the same types of problems existed, which were ceiling effects and chance factors. The nondelayed preschoolers demonstrated appropriate functional use on 10.6 out of 11 objects, receptive vocabulary on 11.8 out of 12 and expressive vocabulary on 11.6 out of 12. Corresponding means for delayed preschoolers were 10.3, 10.5 and 8.4; for nondelayed toddlers were 7.8, 8.7 and 5.5; for delayed toddlers 5.1, 4.4 and 1.2.

Only with the toddler age children, was functional use shown to precede receptive or expressive vocabulary. However, the ceiling affect with the preschoolers may have masked this result. With the preschoolers more difficult items should be included in the assessment. The procedure of assessing receptive and expressive vocabulary within the functional use procedure seemed to overcome the problems previously associated with the two-choice procedures described with delayed children. However, in order to obtain a more accurate assessment of receptive vocabulary, each item should be presented three times with only two choices available. This would allow pattern analysis to be performed on individual objects and a determination made of the number of "known" objects without a chance factor being involved.

Syntax Assessment

Linda Watson, Diane Bricker

In the fall of 1972 a pilot syntax assessment instrument was developed to assess children's skills in the imitation, comprehension, and production of actor-action and actor-action-object strings. This was intended as a screening instrument which would require approximately 15 minutes to administer. Initially, 52 children in the Infant, Toddler and Preschool Research and Intervention Project were tested with the instrument. Twenty-seven of these children were developmentally delayed and 25 were nondelayed. In the delayed group, the CA's of the children ranged from 24 months to 67 months with a mean of 42.7 months. The IQ's of this group ranged from 31 to 86. The nondelayed group ranged in age from 17 to 49 months with a mean of 32.0 months. The IQ scores for this group ranged from 94 to 167. Approximately six months later, 16 of the 27 delayed children and 11 of the 25 nondelayed children were retested. At this time, the delayed children tested ranged in age from 30 to 73 months with a mean of 50 months. The nondelayed children ranged in age from 24 to 52 months with a mean of 38.3 months.

Procedure

The children were tested individually in a small experimental room. One experimenter (E_1) was seated beside the child in front of a modified Wisconsin General Test Apparatus (WGTA) and provided positive feedback to the child for approximations and correct responses and recorded the child's responses. The other experimenter (E_2) sat behind the WGTA, arranged and presented the test stimuli, and also recorded the child's responses.

The test session began with pretraining on imitation. E_2 asked the child to say either, "fat pig" or "red truck." If the child responded correctly or gave a recognizable approximation of one or both words in the phrase, his response was accepted and he was praised and given a small edible or trinket. Three consecutive acceptable responses were required to meet criterion on the imitation pretraining. When this criterion was met, or at the end of ten trials if the child did not meet criterion, E_2 proceeded to comprehension pretraining.

In the comprehension pretraining the opaque door of the WGTA was closed and pictures of a "red truck" and a "fat pig" were placed side by side in the WGTA. Then the door was opened and E_2 said to the child, "fat pig--red truck." The order in which the phrases were stated had no relation to the placement of the picture. Then E_2 said, "Show me 'fat pig' (or 'red truck')." Again three successive correct responses were required for the child to meet criterion. If the child made no response he was prompted to do so. If he made an incorrect response he was told "no" and the WGTA door was closed. Correct responses were consequated with praise and edibles. When criterion was met or when the child had gone through ten trials without reaching criterion, production pretraining was begun.

In production pretraining E_2 closed the opaque door of the WGTA and placed the two pictures (red truck and fat pig) side by side. The door was then opened and E_2 said, "Red truck--fat pig." Again, the order in which the phrases were repeated bore no relation to picture placement. E_2 pointed to one of the pictures and asked, "Which one is this?" If the child verbalized the correct phrase or a recognizable approximation of one or both of the words in the phrase, he was praised and the response was scored as acceptable. Three successive acceptable responses were required to meet criterion. Pretraining was terminated after ten trials if the child did not meet criterion.

After the completion of pretraining the child was tested on all of the three skills (imitation, comprehension, and production) for which he met criterion in pretraining. In the imitation testing he was asked to repeat phrases such as "dog sleeps" and at the three word level, phrases such as "boy sees cow." Correct and approximate responses were reinforced.

In the comprehension testing, E_2 closed the WGTA door and arranged the pictures according to the placement indicated on the test form. The door was then opened, both phrases were repeated, and the child was asked to point to the picture of the repeated phrase. The phrase to be repeated for each trial is underlined on the test form. If the child pointed to the correct picture he was praised as before. If he made an incorrect response, he was told "no" and the WGTA door was closed.

For production testing E_2 arranged the pictures according to the placement indicated on the test form. The WGTA door was opened and E_2 repeated both phrases in the order in which they appeared for that trial on the test form. Then E_2 pointed to the picture representing the underlined phrase for that trial and asked, "Which one is this?" The child was praised for a correct or an approximate answer.

After the testing was completed, the experimenters independently scored the responses which the child had given during the test session. In scoring comprehension, each trial on which the child indicated the appropriate picture was counted correct. In scoring imitation and production, if the child gave a verbalization which included a recognizable approximation of each word in the test phrase in the correct order, the response was scored correct. As long as the experimenters could judge that the child was attempting to say the appropriate phrase, the child was not penalized for phonetic substitutions and deletions. Also, he was not penalized for failing to inflect the verbs.

Results

In the delayed group, the initial testing scores ranged from 0 to 23 out of a possible score of 30. Eight of these children failed to meet criterion during pretraining on any of three test areas (imitation, comprehension, or production) and were, consequently, assigned scores of 0. The mean score for the 27 delayed children was 6.8.

The group of 25 nondelayed children tested in the fall achieved scores ranging from 0 to 30. Three of these children were assigned scores of 0 because they failed to meet pretraining criterion on any of the test areas. One child achieved a score of 30, the highest score possible on this instrument. The mean score for this group was 10.8.

Six months after the initial testing the instrument was readministered to 16 delayed and 11 nondelayed children. For the 16 delayed children, the mean score for the first administration was 6.8 and for the second administration, 11.5. The 11 nondelayed children had a mean score of 15.6 for the first administration and 23.3 for the second administration.

Ten children in the delayed group who received both administrations of the instrument were matched on the basis of CA with 10 children in the nondelayed group who also received both administrations. A Lindquist (1953) Type VI analysis of variance with child groups (delayed and nondelayed) and test areas (imitation, comprehension and production) and test administrations (first and second administrations) as within factors was performed with number correct as the dependent measure.

The analysis indicated significant main effects for child groups, test areas, and test administrations as well as significant child groups by test areas and test administration by test areas interactions (all effects were significant beyond the .05 level). The Newman-Keuls procedure (Winer, 1962) was employed to detect the source of the child groups by test areas interaction revealed that the nondelayed children exhibited a significantly greater number of correct responses on the imitation and production areas than did the delayed children. However, the groups did not differ on the comprehension task. In addition, for the nondelayed children, fewer correct responses were emitted on the production than on the imitation and comprehension areas whereas the delayed children exhibited fewer correct responses on both the imitation and production areas than on the comprehension task (see Figure 11).

The analysis of the test administrations by tests areas interaction utilizing the Newman-Keuls procedure revealed that both the delayed and nondelayed children scored higher on the second administration only on the imitation and production tasks. In addition, both imitation and production scores were lower than comprehension scores on the first administration whereas second administration production scores were lower than both imitation and comprehension scores which did not differ from each other. Mean number correct on the imitation, comprehension and production tasks for the first and second test administrations were 3.9, 6.8, 1.9 and 7.6, 6.9, 3.6 respectively.

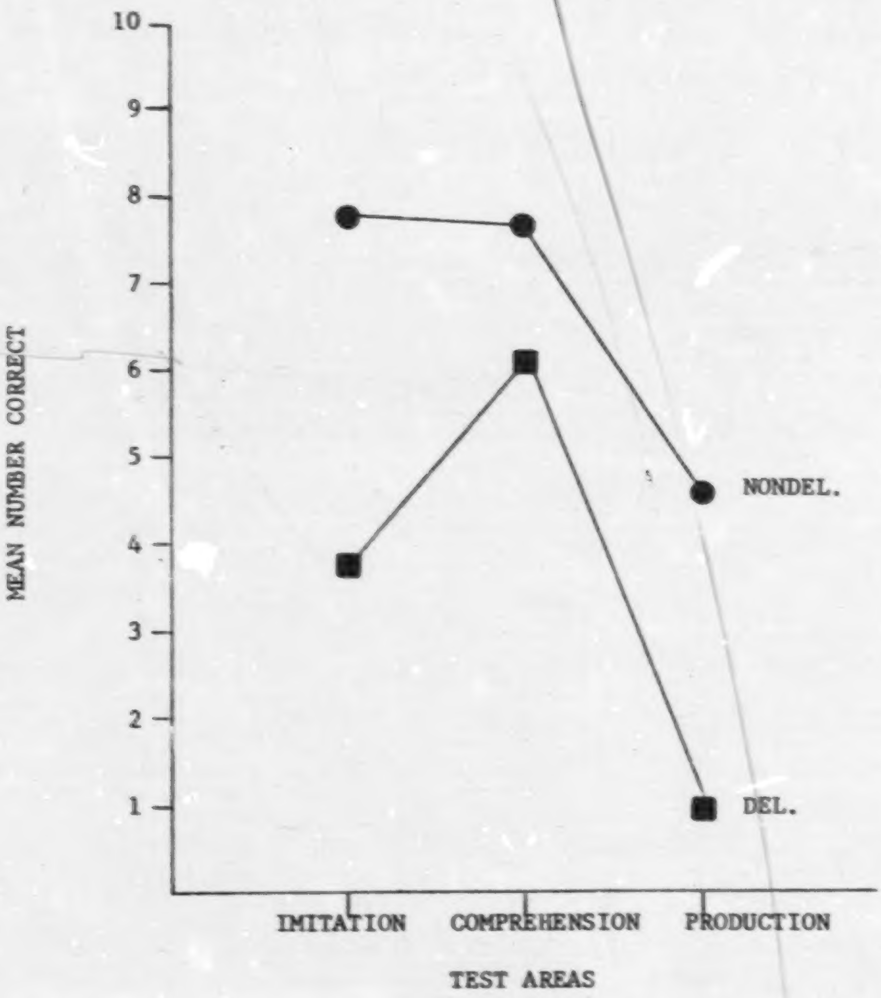

Figure 11. Mean number correct collapsed across test administrations for the delayed and nondelayed children on the test areas, imitation, comprehension and production.

Interrater reliability was computed for the instrument across both administrations and was found to be acceptable (mean percent agreement was 97.4).

Discussion

The syntax screening instrument for young delayed and nondelayed children developed for this investigation was found to be a useful first approximation. The instrument appears to have some validity in that nondelayed children tended to perform better than the delayed children when matched on CA. Also observers were able to consistently agree on the form of the response. Further, approximately 80 percent of the children tested were able to meet the pretraining criteria and were subsequently evaluated in the areas of imitation, comprehension and production of two- and three-word phrases.

The instrument showed shifts in the mean number of correct responses on the imitation and production tasks from the first to the second administration of the test. Possibly, the failure to obtain a shift on the comprehension task resulted from ceiling effects. Subsequent linguistic experience for the nondelayed children and/or classroom language training on syntax for the delayed children could possibly account for the increased number of correct responses on the second administration. If this shift had not occurred, one would question the validity of this instrument.

The findings of the present study did not replicate the Fraser, Bellugi & Brown (1963) results that imitation precedes comprehension which precedes production. No difference was obtained between imitation and comprehension scores for the nondelayed children whereas the delayed child exhibited fewer correct responses on the imitation than on the comprehension task. For both administrations with both groups the production task produced the most errors which was predictable. The nonagreement with the Fraser et al. data gains support from Fernald (1972) who found that when scores for imitation and comprehension tasks were differentially weighted no differences were found between imitation and comprehension performances. That is, previous differences may be attributable to an artifact of the scoring procedure. It should be noted that the above interpretations are tentative because of the apparent ceiling effect on the comprehension and imitation tasks for the nondelayed children. However, the results obtained for the delayed children certainly question the conclusions by Fraser et al. that imitation proceeds comprehensions which proceeds production.

Verbal Imitation Performance as a Function of the Context of Testing

W. Bricker and L. Dennison

Verbal imitation training has become a priority research area in the Infant, Toddler, Preschool Research and Intervention Project because of the slow progress of the developmentally delayed children in acquiring intelligible speech. While work is currently underway to determine what methods of instruction will be successful in improving the abilities of the children in this area, a preliminary investigation was made on methods for assessing progress in the area of verbal imitation. The question asked in this investigation was whether verbal imitation could be most adequately assessed in the context of a consonant-vowel (CV) sound, a repeated CVCV syllable, or a meaningful word.

The 26 children involved in this study were selected from the Infant, Toddler, and Preschool Research and Intervention Project. The children were divided into delayed and nondelayed groups according to assessed developmental level (Stanford-Binet, Form LM or the Cattell Infant Intelligence Test) and the groups were matched on mental age. The CA's of the nondelayed group ranged from 15.0 to 44.0 months with a mean of 27.77 while MA's ranged from 17.0 to 43.0 months with a mean of 28.18. The CA's for the delayed group ranged from 37.0 to 66.0 months with a mean of 50.15 while MA's ranged from 20.0 to 42.0 months with a mean of 27.83.

The test consisted of 24 consonant speech sounds which were presented in three contexts: (1) combined with the vowel /^/

(as in the) to form consonant-vowel (CV), (2) as CVCV sound sequences and (3) as the initial consonant in a group of simple words listed in Table 4. The sound /ŋ/ was tested only in the final position in all contexts while the sound /ʒ/ was tested only in the medial position in the word context.

Table 4

Lexical Items Used to Elicit Initial Consonant Sound

/b/	baby	/g/	go	/ð/	that
/t/	table	/f/	fat	/v/	vest
/w/	water	/s/	see	/j/	yellow
/d/	dog	/r/	run	/θ/	thin
/m/	man	/z/	zoo	/ʒ/	azure
/p/	pie	/ʃ/	shoe		
/h/	hat	/l/	light		
/k/	cat	/tʃ/	choo-choo		
/n/	no	/ŋ/	ding-dong		
/dʒ/	juice				

All children were tested in a small experimental room located near the Project's classrooms. A screening and warm-up procedure was used to insure that all of the children could play the "verbal imitation game." Two vowels /u/ (as in cool) and /i/ (as in feet) were used as the echoic stimuli in the warm-up exercise. During pretraining and testing records of the children's responses were made in phonetic notation by a trained observer. Reliability checks on the phonetic transcription were made by a second observer on ten of the 26 children. Since percentage of agreement was quite high (approximately 90 percent), only records made by the primary observer were used in the data analysis.

Results

The scores for each child could vary between zero and 72. The mean score for the nondelayed group was 31.46 and for the delayed group 27.99. An analysis of variance procedure was used to determine differences between the two groups (delayed-nondelayed), between the three imitation contexts (CV-CVCV-Word), or in the interaction between groups and imitation context. There was no statistically reliable differences between the two groups of children or in the interaction between groups and context. There was a reliable difference in the context dimension ($\underline{F}=5.88$, $\underline{df}$ 2/48, $\underline{p}<.01$). The Newman-Keuls procedure used to evaluate individual context differences indicated that the children produced significantly more correct responses in the CVCV condition than in the CV or word contexts which were not different from each other. However, the differences were small and the three contexts were highly correlated as indicated in Table 5.

A final analysis was made on the error frequencies for each of the 24 sounds. The patterns of errors indicating the relative ease or difficulty of a particular imitated response were quite similar for the delayed and nondelayed groups since their respective patterns were significantly correlated ($\underline{r}=.93$, $\underline{p}<.01$). These

Table 5

Intercorrelation Matrix Using CV, CVCV, and Word Measures for the Delayed and Nondelayed Groups

Contexts	Groups	
	Delayed	Nondelayed
CV x CVCV	r=.92	r=.95
CV x Word	r=.86	r=.90
CVCV x Word	r=.82	r=.90

patterns were used to form a ranked order difficulty index for each of the 24 consonants based on the mean number of correct responses per three productions across the 26 children. This sequence is contained in Table 6.

Discussion

This investigation provided data concerning the adequacy of the verbal imitation assessment procedure and indicated the potential of the procedure for purposes of articulation screening. The CVCV context for imitation produced the greatest frequency of correct imitations. The ranked order of difficulty is quite similar to those produced by other children (Bricker, 1967; W. Bricker & D. Bricker, 1972a).

Table 6

Rank Order Sequence Based on the Mean Rate Correct in Three Productions

Sound		Rank	M/3 Prod.
1.	b	1	2.87
2.	d	2	2.75
3.	m	3	2.72
4.	n	4	2.65
5.	h	5	2.40
6.	w	6	2.37
7.	p	7	2.35
8.	g	8	2.10
9.	t	9	2.00
10.	k	10	1.72
11.	f	11	1.40
12.	l	12	1.32
13.	ŋ	13.5	1.18
14.	j	13.5	1.18
15.	dʒ	15	1.02
16.	tʃ	16	.75
17.	v	17.5	.62
18.	s	17.5	.62
19.	ʃ	19	.60
20.	r	20	.40
21.	ʒ	21	.38
22.	z	22	.32
23.	ð	23	.28
24.	θ	24	.10

Functional Classification, Imitation,
Comprehension and Production in Preschool Children

W. Bricker and L. Dennison

The purpose of this investigation was to examine the patterns of performance of three groups of children differing in developmental level (mental age placements) across five facets of language related performance. The five language domains consisted of functional classification, verbal imitation of sounds, comprehension of nouns verbal imitation of nouns, and production of nouns. These domains constitute the basic repertoire in the first stages of the language training program used in the Infant, Toddler, and Preschool Research and Intervention Project (Bricker, Dennison, Watson, Vincent-Smith, 1973).

The subjects in this investigation were 33 children from the Toddler and Preschool classrooms of the Project. The children's CA's ranged from 24 to 75 months with a mean of 46.81, while their developmental ages ranged from 19 to 54 months with a mean of 33.75. The range of developmental ages for the three groups used in this investigation are given in Figure 12.

The 13 objects representing the test sounds and words used in this investigation included a boy (doll), hat, shoe, comb, a bar of soap, a baby (another doll), cup, spoon, pan, a dog (a miniature toy), bowl, bunny (another miniature toy), and a small wagon. These objects were selected because their labels or names are composed of easy to produce sounds (Bricker, 1967). The sounds that were used in these 13 words are given in Table 7. The procedure for measuring the five language domains in the context of these 13 words was the following:

Table 7

Sounds Used in the 13 Test Stimuli

Consonants	Vowels and Diphthongs
/k/ as in cup	/u/ as in spoon
/p/ as in pan	/æ/ as in pan
/b/ as in boy	/eI/ as in baby
/n/ as in nest	/ʌ/ as in cup
/h/ as in hat	/i/ as in eat
/t/ as in too	/o/ as in soap
/s/ as in soap	/ɔI/ as in boy
/m/ as in man	/aI/ as in ride
/w/ as in wagon	/ɔ/ as in jaw
/g/ as in go	/ʊ/ as in cook
/d/ as in dog	
/r/ as in ride	
/l/ as in apple	

a. Functional classification. In this domain the child was to use each of the objects in an appropriate manner such as drinking from the cup, eating with the spoon, putting the spoon in the baby's mouth, having the toy bunny ride in the wagon, or other relationships that are typical of the objects in the selected group.

b. Verbal Imitation of Sounds. The sounds presented in Table 7 above were tested three times each in a CV context similar to the procedure described in the previous investigation.

c. Comprehension. This receptive vocabulary assessment was made by arranging the objects in front of the child in a random order and then asking the child to touch the named object or to hand the named object to the experimenter. Each object was named three times following a random sequence.

d. Verbal Imitation of Words. In this assessment, the children were asked to verbally imitate the names of the 13 objects with each word presented three times in random order.

e. Object naming. In the final assessment, each of the 13 objects was shown to the child and he was asked to name the demonstrated object. Each of the objects was presented three times in a random order.

Each of these assessments was done in a small testing room close to the classrooms. Each of the children's responses were recorded by an observer-recorder. For approximately 50 percent of the assessments a second observer recorded the child's response. The reliability values for the two raters ranged from 85 to 100 percent agreement across the five domains with a mean percentage of .98.

Results

The mean percent correct for the three MA groups across the five language domains are presented in Figure 12. A two way analysis of variance was computed for these values using the three MA groups as a between factor and the five language domains as a within factor. The results indicated a statistically reliable difference between the three groups (_F_=16.89, _df_ 2/30, _p_<.01), and among the five domains (_F_=70.88, _df_ 4/30, _p_<.01), as well as in the interaction between MA groups and domains (_F_=4.20, _df_ 8/30, _p_<.01). As a first step in detecting the source of significant groups by domains interactions, separate one-way analyses of variance were computed for groups at each level of the within factor domains. Where significant MA group effects were obtained, the Newman-Keuls procedure was used to test for differences between the means. In functional classification of objects, the lowest MA group performed at a reliably lower level than either of the other two MA groups but the latter were not statistically different from each other. In verbal imitation of speech sounds, the highest MA performed statistically better than the other two groups but the middle and lower MA groups were not different from each other. In the comprehension of nouns, the low MA group was significantly below the other two groups but the latter were not different from each other. Finally, in the production of nouns, only the difference between the high and the low MA group was statistically reliable. The differences among the five domains when the data were collapsed on the MA dimension indicated that there were no differences

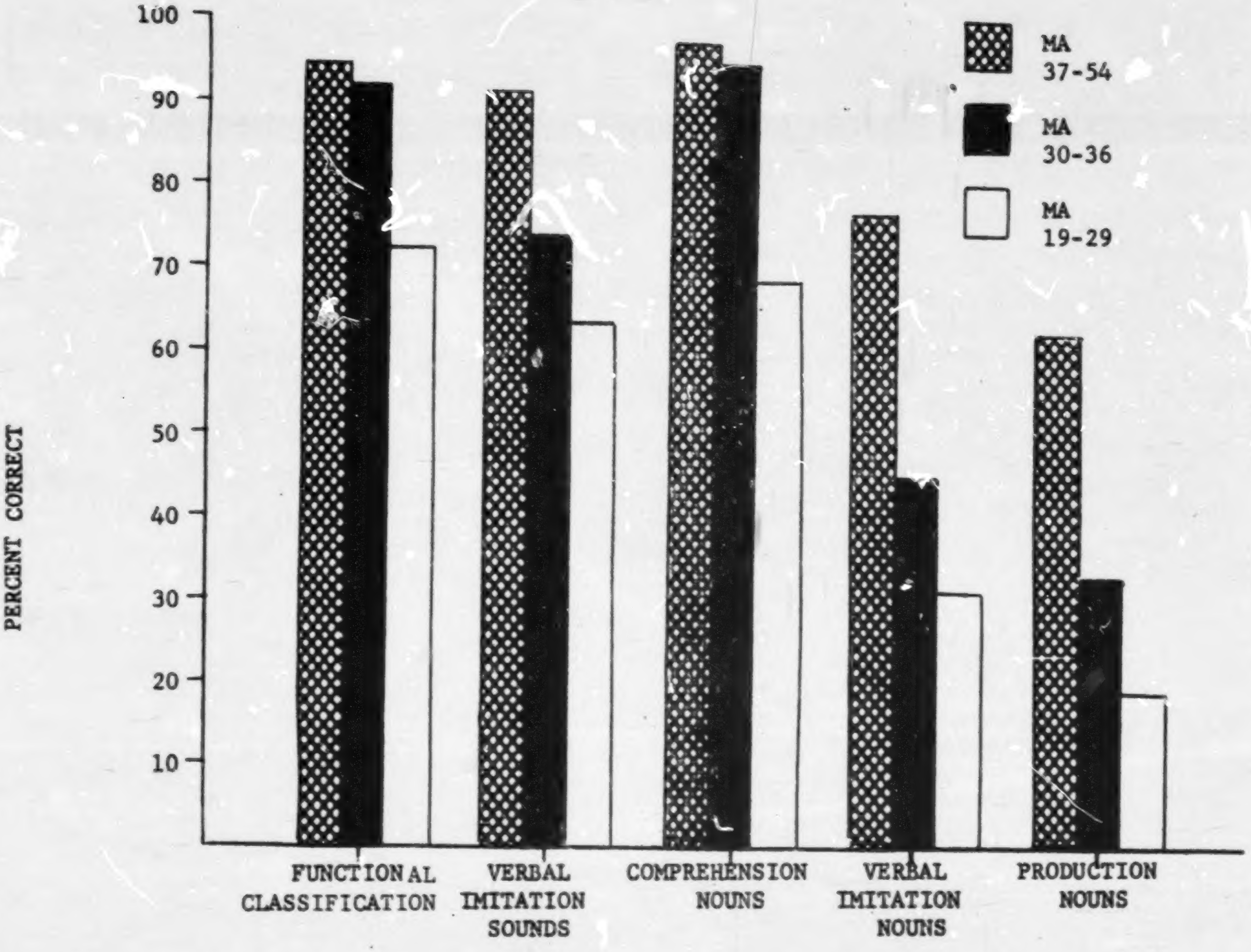

Figure 12. Mean number correct on the five language related domains for the three MA groups.

among the first three domains of functional classification, verbal imitation of sounds, and comprehension of nouns, but each of these domains had a significantly higher rate of correct responses than either verbal imitation of nouns or the production of nouns. The difference between word imitation and production was also significantly different with a higher performance recorded on the imitation domain.

Discussion

Previous assessment of the domains of functional classification, verbal comprehension, and verbal production (Vincent-Smith & D. Bricker, 1972) had indicated a statistically reliable difference between these three domains with functional classification occurring more often than either comprehension or production for a younger MA group but this difference was not found in the present investigation. Of importance here is that children are able to imitate sounds better than they imitate words so that an imitation training program beginning with sounds would probably be more successful than one starting with the semantic units involved in words. However, the ability to imitate words seems to be the key bridge between the comprehension of object names and the ability to produce these names expressively. In fact, the verbal imitation of words has been found to be the best predictor of expressive language in this as well as in a number of previous investigations (W. Bricker & D. Bricker, 1972b). Consequently, this investigation coupled with the one by Vincent-Smith and Bricker suggests that the order of training should start with functional classification followed by verbal imitation at the sound level in tandem with training word comprehension and then moving through verbal imitation of words into expressive language. However, this order of training is still at the level of a working hypothesis and needs to be systematically evaluated in subsequent intervention research.

References

Bijou, S., & Baer, D. M. *Child development*. Vol. 1. New York: Appleton-Century-Crofts, 1966.

Breger, L., & McGaugh, J. L. Critique and reformulation of "learning theory" approaches to psychotherapy and neurosis. *Psychological Bulletin*, 1965, 63, 338-358.

Bricker, D. D., & Bricker, W. A. *Toddler Research and Intervention Project Report: Year II*. IMRID Behavioral Science Monograph No. 21, George Peabody College, Nashville, Tennessee, 1972.

Bricker, D., Dennison, L., Watson, L., & Vincent-Smith, L. *Language training program for young developmentally delayed children*. Vol. 2. *Training the basic actor-action-object proposition*. IMRID Behavioral Science Monograph No. 22, George Peabody College, Nashville, Tennessee, 1973.

Bricker, D. D., Vincent-Smith, L., & Bricker, W. A. Receptive vocabulary: Performances and selection strategies of delayed and nondelayed toddlers. *American Journal of Mental Deficiency*, 1973, 77, 579-584.

Bricker, W. A. Errors in the echoic behavior of preschool children. *Journal of Speech and Hearing Research*, 1967, 10, 67-76.

Bricker, W. A., & Bricker, D. D. Assessment and modification of verbal imitation with low-functioning children. *Journal of Speech and Hearing Research*, 1972, 15, 690-698. (a)

Bricker, W. A., & Bricker, D. D. The use of programmed language training as a means for differential diagnosis and educational remediation among severely retarded children. Final Report, George Peabody College, Contract No. OEG2-7-070218-1629, U. S. Office of Education, September 1972. (b)

Bricker, W. A., & Bricker, D. D. An early language training strategy. In R. Schiefelbusch & L. Lloyd (Eds.), Language perspectives--Acquisition, retardation, and intervention. Baltimore: University Park Press, 1974, in press.

Bruner, J. S. Toward a theory of instruction. New York: Norton Co., 1966.

Catania, A. C. The psychologies of structure, function, and development. American Psychologist, 1973, 28, 434-443.

Chomsky, N. Syntactic structures. The Hague: Mouton, 1957.

Chomsky, N. Review of Skinner's Verbal behavior. Language, 1959, 35, 26-58.

Chomsky, N. Aspects of the theory of syntax. Cambridge: The MIT Press, 1965.

Chomsky, N. Topics in the theory of generative grammar. The Hague: Mouton, 1966.

Dobzhansky, T. Genetics and the diversity of behavior. American Psychologist, 1972, 27, 523-530.

Ellis, N. R. (Ed.) International review of research in mental retardation. New York: Academic Press, 1966-1973. 6 vols.

Escalona, S. K., & Corman, H. H. Albert Einstein Scales of Sensorimotor Development. Unpublished manuscript, Albert Einstein College of Medicine, 1966.

Fernald, C. D. Control of grammar in imitation, comprehension, and production: Problems of replication. *Journal of Verbal Learning and Verbal Behavior*, 1972, 11, 606-613.

Fraser, C., Bellugi, U., & Brown, R. W. Control of grammar in imitation, comprehension, and production. *Journal of Verbal Learning and Verbal Behavior*, 1963, 2, 121-135.

Gallagher, J. J., & Bradley, R. H. Early identification of developmental difficulties. In the *Seventy-first Yearbook of the National Society for the Study of Education*, Part II. Chicago: University of Chicago Press, 1972.

Green, B. F. A method of scalogram analysis using summary statistics. *Psychometrika*, 1956, 21, 79-88.

Haywood, H. C. Labeling: Efficacy, evils, and caveats. Paper presented at the Joseph P. Kennedy Jr. Foundation International Symposium on Human Rights, Retardation, and Research, Washington, D. C., October 1971.

Haywood, H. C., & Filler, J. W., Jr. Psychological and sociological perspectives on intelligence. In H. C. Haywood (Ed.), *Psychometric intelligence*. New York: Appleton-Century-Crofts, in press.

Hunt, J. McV. *Intelligence and experience*. New York: Ronald Press, 1961.

Hunt, J. McV. Psychological assessment in education and social class. Paper presented at the conference on the Legal and Educational Consequences of the Intelligence Testing Movement: Handicapped Children and Minority Group Children. University of Missouri, Columbia, 1972.

Katz, J. J. Mentalism in linguistics. In L. A. Jakobovits & M. S. Miron (Eds.), *Readings in the psychology of language*. Englewood Cliffs, N. J.: Prentice-Hall, 1967.

Kogan, K. L., & Tyler, N. Mother child interaction in young physically handicapped children. *American Journal of Mental Deficiency*, 1973, 77, 492-498.

Leiter, R. G. *Examiner's manual for the Leiter International Performance Scale*. Chicago: Stoelting Co., 1969.

Lindquist, E. F. *Design and analysis of experiments in psychology and education*. Boston: Houghton Mifflin, 1953.

Miller, G. A., Galanter, E., & Pribram, K. H. *Plans and the structure of behavior*. New York: Holt, Rinehart & Winston, 1960.

Piaget, J. *The origins of intelligence in children*. New York: W. W. Norton, 1952.

Piaget, J. *The construction of reality in the child*. New York: Ballantine Books, 1954.

Piaget, J. *The language and thought of the child*. New York: World Publishing, 1962.

Piaget, J. *Six psychological studies*. New York: Random House, 1967.

Piaget, J. Piaget's theory. In P. H. Mussen (Ed.), *Carmichael's manual of child psychology*. Vol. 1. (3rd ed.) New York: John Wiley, 1970.

Piaget, J., & Inhelder, B. *The psychologie of the child*. New York: Basic Books, 1969.

Ray, B. A., & Sidman, M. Reinforcement schedules and stimulus control. In W. N. Schoenfeld (Ed.), *The theory of reinforcement schedules*. New York: Appleton-Century-Crofts, 1970.

Robinson, C. C., & Filler, J. W., Jr. A parent teaching style assessment scale. Paper presented at the American Association on Mental Deficiency, Minneapolis, May 1972.

Sinclair-de-Zwart, H. Developmental psycholinguistics. In D. Elkind & J. H. Flavell (Eds.), *Studies in cognitive development*. New York: Oxford University Press, 1969.

Stott, L. H., & Ball, R. S. Evaluation of infant and preschool mental tests. *Monograph of the Society for Research in Child Development*, 1965, 30(3, Serial No. 101).

Uzgiris, I. C. Patterns of cognitive development in infancy. *Merrill Palmer Quarterly*, 1973, 19, 181-204.

Uzgiris, I. C., & Hunt, J. McV. An Instrument for Assessing Infant Psychological Development. Unpublished manuscript, University of Illinois, 1966.

Vincent-Smith, L., & Bricker, D. A comparison of receptive vocabulary skills in the delayed and non-delayed toddler. In D. Bricker & W. Bricker, *Toddler Research and Intervention Report*: *Year II*. IMRID Behavioral Science Monograph No. 21, George Peabody College, Nashville, Tennessee, 1972.

Vincent-Smith, L., Bricker, D. D., & Bricker, W. A. Acquisition of receptive vocabulary in the toddler-age child. Child Development, in press.

Weimer, W. B. Psycholinguistics and Plato's paradoxes of the Meno. American Psychologist, 1973, 28, 15-33.

Winer, B. J. Statistical principles in experimental design. New York: McGraw-Hill, 1962.

Wolfensberger, W. The principle of normalization in human services. Toronto: National Institute on Mental Retardation, 1972.